13 Gunshot Wound Deaths

Death rates due to gunshot wounds vary greatly around the world with high rates occurring in countries such as South Africa, Mexico, and the United States. Injuries caused by projectiles (missiles or bullets) fired from guns (firearms) have characteristic features that are influenced by the caliber of the weapon and the distance from the gun to the victim. The term "penetrating" is used when a projectile or missile has entered the body but not exited, whereas the term "perforating" indicates that the projectile/missile has passed completely through the body.

Weapons and Ammunition

The basic structure of a firearm consists of the part that is held by the hand that has the trigger finger – the grip, the part from which the bullet exits – the barrel, the trigger, the internal mechanisms that transfer the trigger pull into the firing of the bullet (usually including a "firing pin"), the firing chamber (which holds the cartridge that contains the bullet or projectiles to be fired), and, frequently, a mechanism which allows for a mechanized means of quickly supplying another round (bullet) to be fired. There are three basic types of firearms: handguns, rifles, and shotguns. Rifles and shotguns are classified as long guns due to the length of their barrels and usually have a stock that extends from the grip that allows for the weapon to be braced against the shoulder during discharge.

The inside surface of the barrels of most handguns and rifles have spiraling grooves along their length known as rifling. The raised parts are known as lands and the depressed parts as grooves. The purpose of rifling is to impart a spin to a bullet which makes it more aerodynamically stable and therefore straighter in its course. Rifling differs in different weapons with different directions of spin (i.e., either right twist or a left twist) and different numbers and sizes of the lands and grooves. A weapon's caliber depends on the diameter of the barrel and thus on the diameter of the bullets that are fired.

The combination of a rifled weapon's caliber, as well as the number, size, and twist of lands and grooves determine the weapon's "class characteristics." The unique microscopic striations (toolmarks) imparted onto a bullet from the barrel represent the weapon's "individual characteristics" and allow a bullet to be "matched" to a specific weapon. In contrast, shotguns tend to have "smooth" bores, meaning the internal surface of the barrel is not rifled but is smooth. The diameter of the barrel is referred to as the shotgun gauge. The "choke" of a shotgun refers to the extent of constriction that occurs at the muzzle end of the barrel.

A "cartridge" is composed of a "casing" that contains in its base a primer (a method for transferring the trigger pull mechanism into ignition of gunpowder), the gunpowder itself, and the bullet, which is tightly embedded into the open end of the casing. The two types of primers are the centerfire primer, located in the center of the base of the cartridge, and the rimprimer, located in the outer rim of the base of the cartridge casing. When the firing pin strikes the primer, the primer explodes and ignites the gunpowder. The exploding gunpowder expels the bullet from the end of the cartridge. Besides the bullet, there are other items that travel down and out of the barrel. Especially in handguns, the flames from the exploding gunpowder can be seen at the muzzle (open end) of the barrel. Also, a cloud of smoke (soot) created by the exploding gunpowder is expelled from the muzzle. Finally, particles of unburnt as well as burning gunpowder are also expelled from the end of the barrel.

Most handgun and some rifles fire what is typically referred to as "low-velocity" ammunition. The muzzle velocity of these bullets varies from around 750 ft/s to around 1,400 ft/s. In contrast, high-velocity ammunition (which tends to be either military or hunting ammunition fired from high-velocity rifles) usually has a muzzle velocity in the range of 2,300 ft/s to over 3,000 ft/s.

Handguns: A majority of gunshot wound deaths that occur in the United States occur with the use of handguns. Handguns are weapons having short barrels that can generally be held and controlled with one hand. The usual handgun barrel is rifled. There are two basic types of handguns: revolvers and semiautomatic pistols, but other miscellaneous types also exist. Revolvers contain a cylinder within which multiple bullets are placed. After one bullet is fired from a revolver, in order for another bullet to be fired, the cylinder must rotate so that the next bullet is in proper alignment with the firing pin and the barrel. Although commonly mischaracterized within the media as "automatic weapons" (which can fire continuously so long as the trigger is depressed), a semiautomatic firearm requires a separate trigger-pull for each discharge. The "semiautomatic" description applies to the self-loading aspect of the firing mechanism. In a semiautomatic weapon, the discharge provides enough energy to mechanically eject the spent (used) cartridge casing from the weapon and insert a new, unspent cartridge into the firing chamber. In this way, after a bullet is fired, the weapon is ready to fire again.

A variety of ammunition types are available for handguns. In general, the diameter of the bullet can be used to classify a given bullet as either small, medium, or large caliber. Examples of small-caliber bullets include the 0.22 and the 0.25 ACP. Examples of medium caliber bullets include the 0.32 ACP, the 0.38 special, the 0.380 ACP, and the 9-mm. Examples of large caliber bullets include the 0.40 S&W and the 0.45 ACP.

Rifles: Rifles are long guns with rifled barrels. There are two general categories: low-velocity (usually rimfire 0.22) and high-velocity (a variety of calibers/ammunition types). High-velocity rifles may fire hunting ammunition or military ammunition. In general, hunting ammunition is designed to break apart on

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impact so that the projectile is less likely to completely perforate the target and harm something behind the target. In contrast, most military rounds are designed to completely perforate the target.

Shotguns: Shotguns are long guns having smooth (non-rifled) barrels (bores), as described above. There are generally two types of ammunition utilized in shotguns. They can fire "shot," which are spherical metal (lead or steel) pellets that are available in a variety of sizes, ranging from small "birdshot" (0.05–0.22 in. diameter) to large "buckshot" (0.24–0.36 in. diameter). The shot pellets are contained within a shot-shell cartridge, where the collection of pellets overlie various forms of "wadding," which acts to separate the pellets from the underlying gunpowder. Different ammunition manufacturers utilize different types of wadding. A second type of ammunition used in shotguns is the shotgun "slug." A slug is a single, large piece of metal (usually lead) that is fired from the weapon.

Gunshot Wounds

Entrance wounds: A typical entrance wound has a round or oval-shaped skin defect, surrounded by a rim of abrasion. This rim is variably referred to as an "abrasion collar" or a "circumferential marginal abrasion" (the "margin" of the wound being the edge or rim). The width of the marginal abrasion can provide an indication of the relative angle of the bullet as it enters the skin. If the marginal abrasion is of a consistent width, then the bullet entered the skin in a relatively perpendicular fashion. If a bullet goes through something else prior to striking the skin, it is said to have passed through an "intermediary" or "interposed" target. Depending on the characteristics of the interposed target, the bullet may produce an irregularly shaped wound with wide marginal abrasions known as an "atypical entrance wound."

Range of fire: Entrance wounds can vary in their overall appearance based on the "range of fire" (how far the muzzle of the weapon is from the target/skin). In "contact wounds" that occur over the skull, the explosive gases and smoke that discharge from the weapon can dissect between the skin and the bone in the area immediately surrounding the entrance defect, causing a "stellate" or "starburst" appearance. Many contact wounds (of whatever location) have associated charring of the skin, with soot deposited within the depths of the wound. Some contact wounds have "muzzle imprint abrasions." If a weapon's muzzle is close to, but not in contact with the skin, then soot and gunpowder will be evident around the entrance skin defect. These wounds may be referred to as "close-range" entrance wounds. The soot can sometimes be washed away, but the gunpowder particles actually strike and injure (and sometimes become embedded within) the skin, and cannot be washed away. The resulting marks are referred to as "gunpowder stipple marks" or "gunpowder tattooing." With most handguns, soot in combination with gunpowder stippling around gunshot entrance wounds can occur when the muzzle of the weapon is up to about 12 in. from the skin. "Medium" (or "intermediate") range gunshot entrance wounds are characterized by gunpowder stippling, but no soot surrounding the entrance defect. These typically occur when the weapon is greater than 12 in. but less than about 3 ft from the skin. Once the weapon is more than about 3 ft from the skin (or clothing) surface, gunpowder particles do not typically have enough energy to actually produce stipple injuries. Gunshot entrance wounds with no associated soot or gunpowder stippling are referred to as "distant" wounds, meaning more than about 3 ft. A better term that is preferred by many forensic pathologists is "indeterminate," since closer range shots where the soot and gunpowder is totally blocked by clothing or other interposed target may produce identical appearing wounds.

Exit wounds: Exit wounds from low-velocity firearms tend to be relatively small, and they can have a variety of shapes, ranging from slit-like to comma-shaped to X-shaped to irregularly shaped. Exit wounds may or may not have central, round to oval defects, but the typical exit wound does not have marginal abrasions. With low-velocity ammunition, it is not infrequent for bullets to lack enough energy to actually exit the body, especially when small-caliber ammunition is utilized. High-velocity exit wounds tend to be very large and destructive.

Graze wounds: Graze gunshot wounds (those that strike the skin surface in a tangential fashion) are not uncommon. They can range from wounds that only injure the very superficial layers of the epidermis to those that completely disrupt the epidermis and also injure the underlying dermis, and possibly the subcutaneous fatty tissues. The typical graze wound has an elongated oval shape. In certain instances, the direction of the graze wound can be determined based on the characteristics of the graze wound.

High-velocity wounds: Many of the features of high-velocity wounds related to range of fire and general features of wound types are similar to those of low-velocity wounds, with some noted exceptions. Many high-velocity entrance wounds do not have a significant marginal abrasion. Instead, they frequently demonstrate multiple marginal microlacerations. High-velocity exit wounds tend to be quite large and destructive, sometimes occurring as multiple exit sites. X-ray examination of high-velocity wounds from bullets that fragment characteristically show what is described as a "lead snowstorm" appearance.

Shotgun wounds: There are two basic types of projectiles that can be fired from a shotgun: shot pellets (birdshot and buckshot) and slugs. Some of the features of shotgun wounds are similar to those described with low-velocity gunshot wounds, but there are many additional features that deserve attention. Contact wounds, particularly of the head, are extremely devastating, whether birdshot, buckshot, or slugs are used.

The appearance of shotgun wounds utilizing pellets varies depending on the range of fire. At close range, there is a single round to oval defect with smooth borders. As the distance from muzzle to skin lengthens, the borders become scalloped, then "satellite" individual pellet wounds occur around a central defect, and, finally, only many individual separate pellet wounds occur, with no central defect. Measuring the diameter of the pellet spread pattern on the skin surface can assist in estimating the range of fire, no matter what the size of pellet used. Injuries from wadding may also occur.

Birdshot pellets tend not to exit, but instead, remain within the body. Buckshot pellets may or may not exit. Buckshot exit wounds appear similar to those produced by low-velocity handguns. X-ray examination of shotgun pellet injuries will reveal the approximate size (bird versus buck), but are not reliable for estimating the skin spread pattern since, internally, the pellets strike tissues and each other, resulting in the pellets "spreading out." This is sometimes referred to as the "billiard ball effect."

Shotgun slugs are tremendously large projectiles. As such, they can produce massive injuries. Even noncontact wounds of the head with shotgun slugs can produce injuries that might otherwise appear to be contact wounds. Slug entrance wounds mimic classic entrance wounds; however, they tend to be larger. Slugs frequently break apart within the body. On x-ray exam, fragments of slugs frequently have a C-shape (depending on the direction of x-ray beam).

Fig. 13.1
Two handguns (semiautomatic and revolver) and a rifle

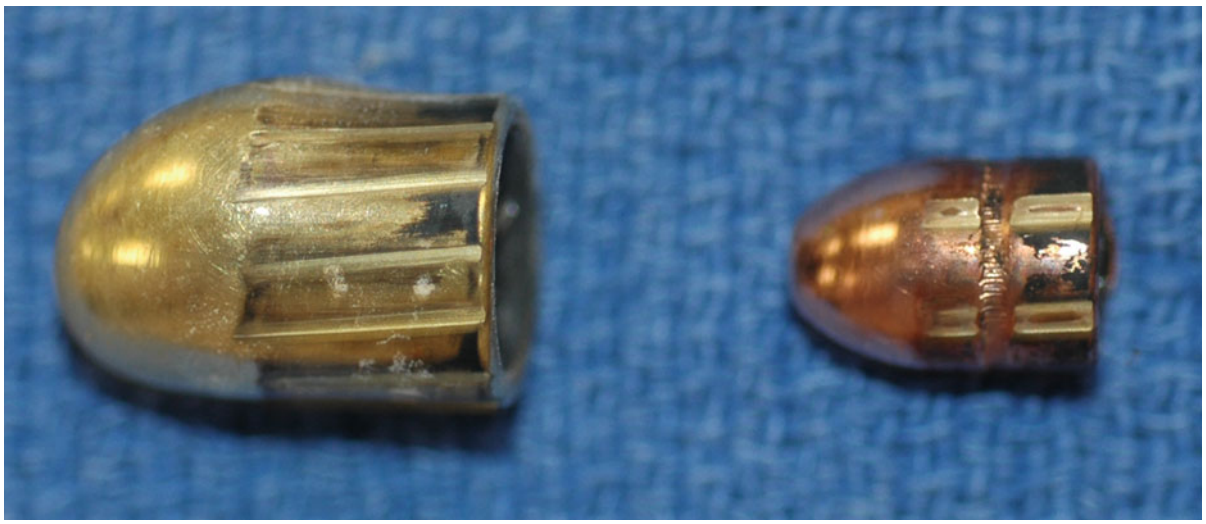

Fig. 13.2
Two bullets with rifle marks

Fig. 13.3
An unspent (unfired) handgun cartridge. The silver-colored casing contains the unspent bullet, which has a copper jacket

Fig. 13.4
An intact cartridge and an opened cartridge, showing the casing, the gunpowder, and the bullet

Fig. 13.5
Comparison of a rimfire cartridge (*left*) and a centerfire cartridge (*right*)

Fig. 13.6
Additional comparison of rimfire (*left*) versus centerfire (*right*) cartridges. In rimfire cartridges, the primer material is embedded in the rim of the casing, while in centerfire cartridges, the primer material is within the centrally located, circular area

Fig. 13.7
Typical muzzle flash from a handgun

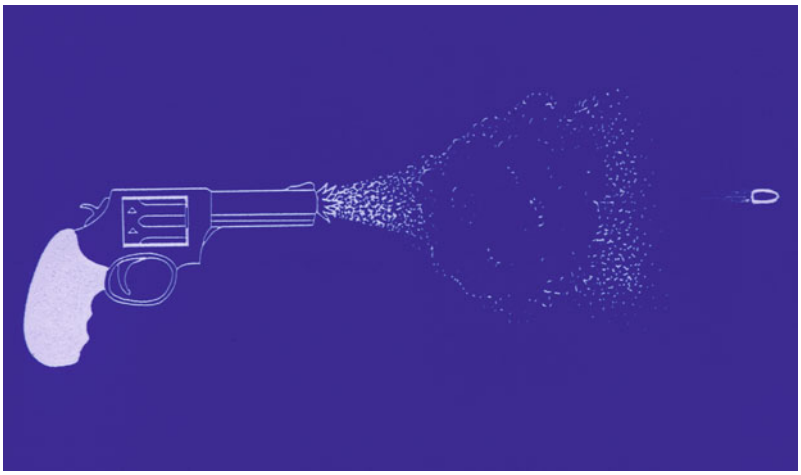

Fig. 13.8
Diagram of a discharging firearm, showing a small amount of flame at the muzzle, a cloud of smoke/soot, particles of gunpowder, and the bullet

Fig. 13.9
Comparison of semiautomatic (*left*) and revolver (*right*) cartridges. Notice that the rim of the semiautomatic cartridge casing is recessed compared to that of the revolver, where the outer edge of the rim extends beyond the outer diameter of the remainder of the casing

Fig. 13.10

A 0.357 revolver. The cylinder in this particular model holds 6 cartridges and has a smooth contour (it is "non-fluted." Many revolver cylinders are "fluted" – they have indentations). Note the narrow gap between the front of the cylinder and the beginning of the barrel (*arrow*). This is referred to as the "cylinder-barrel gap" and is important because gunshot residue exits this area when the gun is discharged

Fig. 13.11

A 9 mm semiautomatic pistol

Fig. 13.12
Examples of handgun ammunition of various calibers. *Top* (L to R): 0.22, 0.38 special, 0.44 magnum; *Bottom* (L to R): 0.25, 0.32, 0.380, 9 mm, 0.40 S&W, 10 mm, 0.45 ACP, 0.50 caliber

Fig. 13.13
A variety of special bullet types. The lower row shows unfired bullets only, while the upper two rows show unfired bullets (*middle row*) immediately below an example of the corresponding fired bullet (*upper row*). *Lower row* (L to R): full-metal-jacketed bullet, brass-colored full-metal-jacketed bullet, wadcutter, semi-wadcutter, Nyclad, aluminum-jacketed bullet. *Middle and upper rows* (L to R): jacketed soft point, Black Talon, Hydrashok, Silvertip, Golden Saber, Gold-Dot

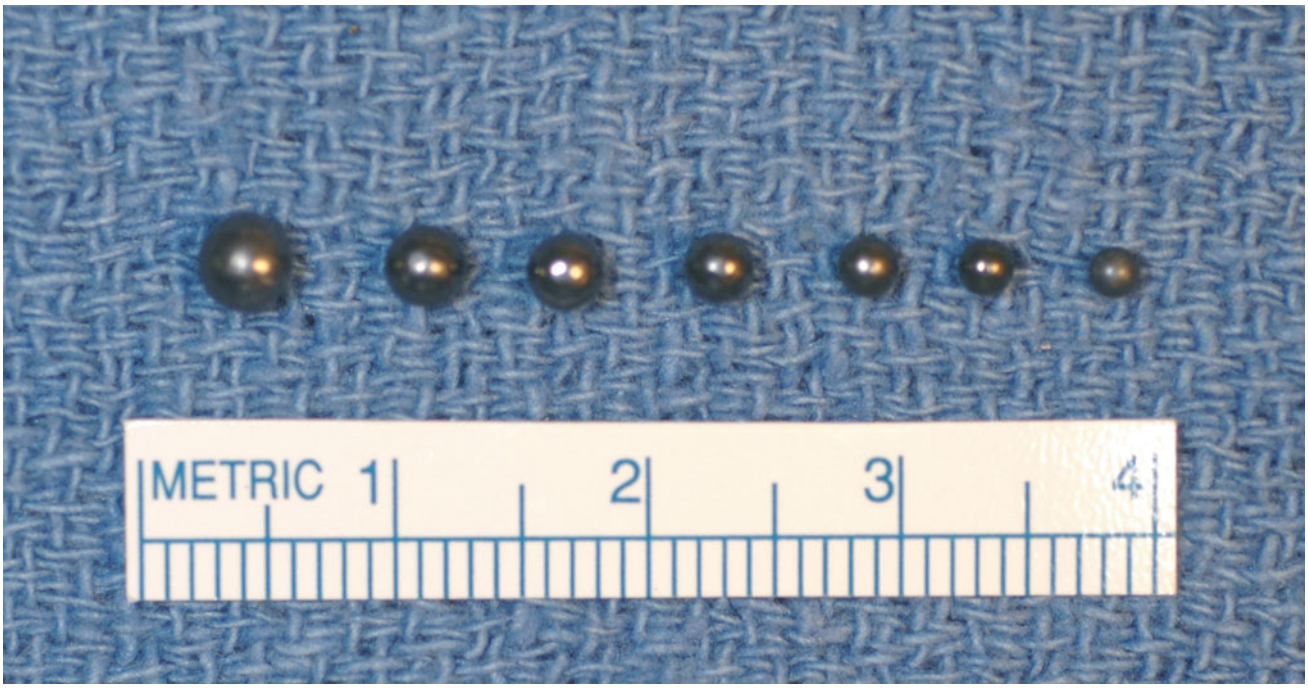

Fig. 13.14
A variety of different sized birdshot pellets. L to R: #2, #4, #5, #6, # 7 ½, #8, and #9

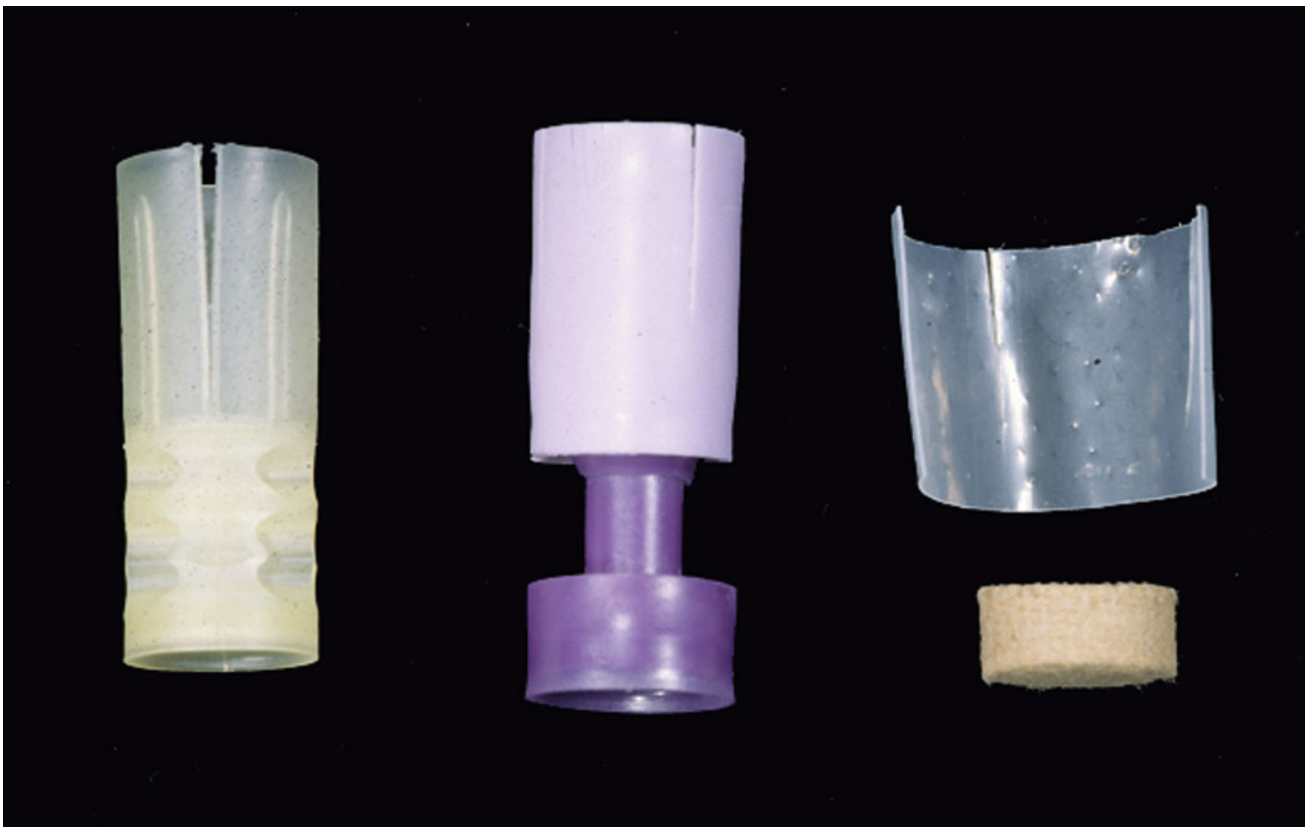

Fig. 13.15
Various types of wadding material from within shotgun cartridges

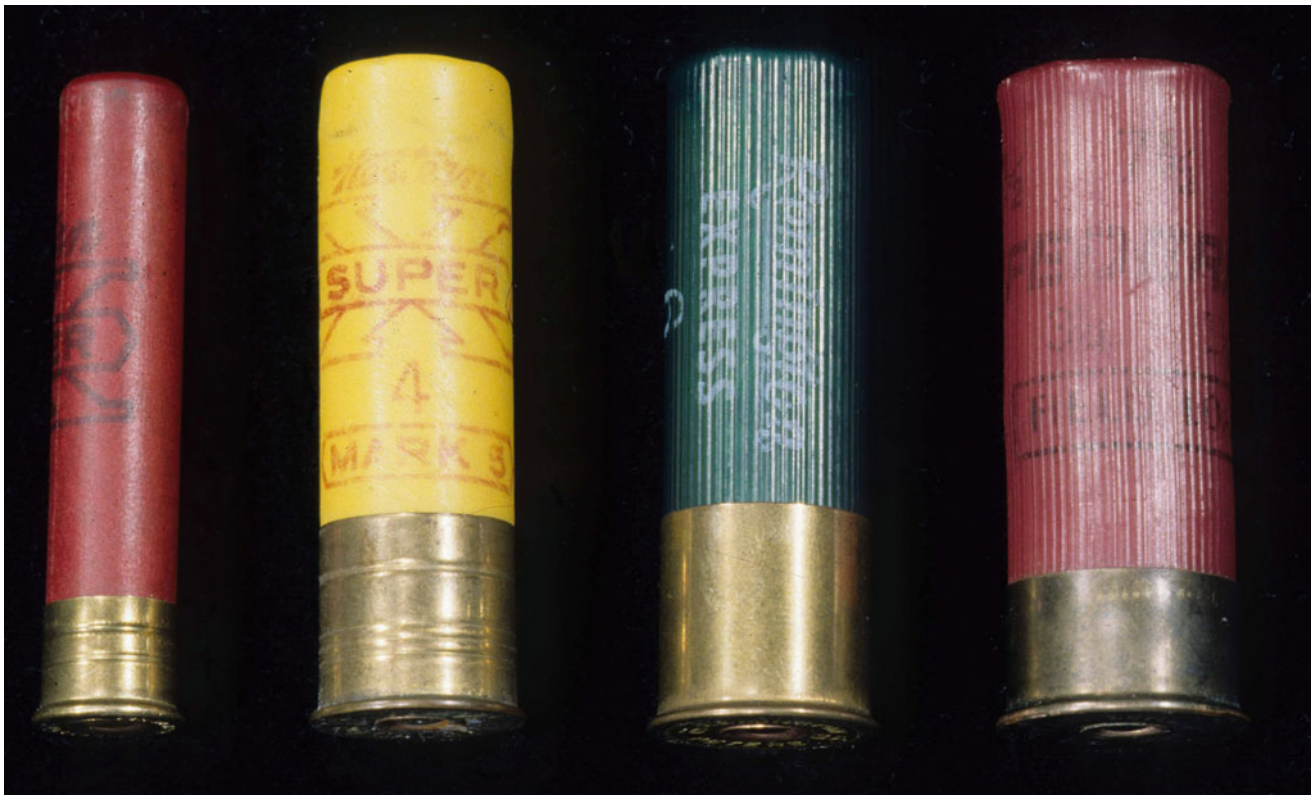

Fig. 13.16
Shotgun shells of various sizes (gauges)

Fig. 13.17
Various types of shotgun slugs

Fig. 13.18
An X-ray showing a partially fragmented bullet

Fig. 13.19
Breakup of a bullet in the neck on X-ray

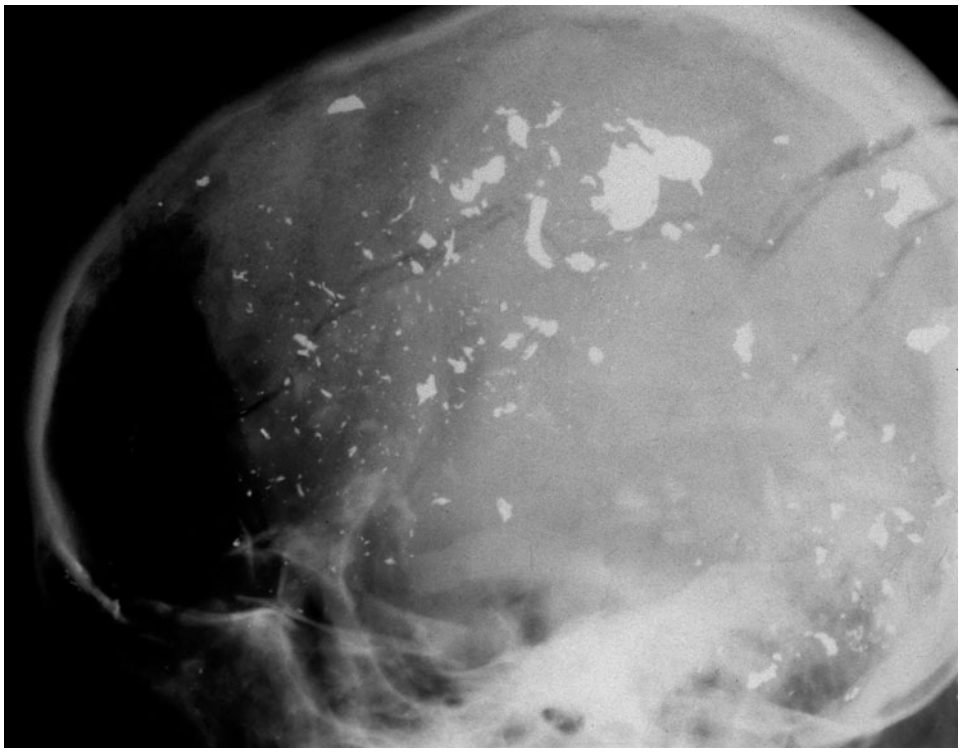

Fig. 13.20
Breakup of a bullet within the cranial cavity as seen on X-ray

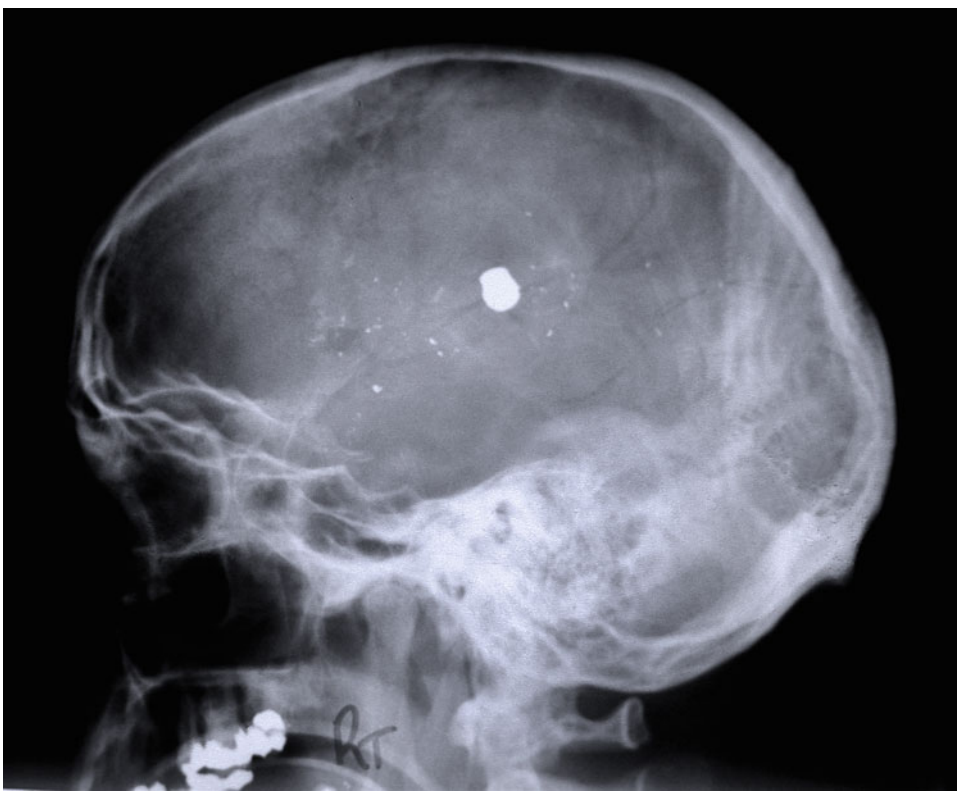

Fig. 13.21
An X-ray of a single intact 0.22 caliber bullet in the head in a suicide victim

Fig. 13.22
An X-ray showing the presence of two projectiles in the pelvis

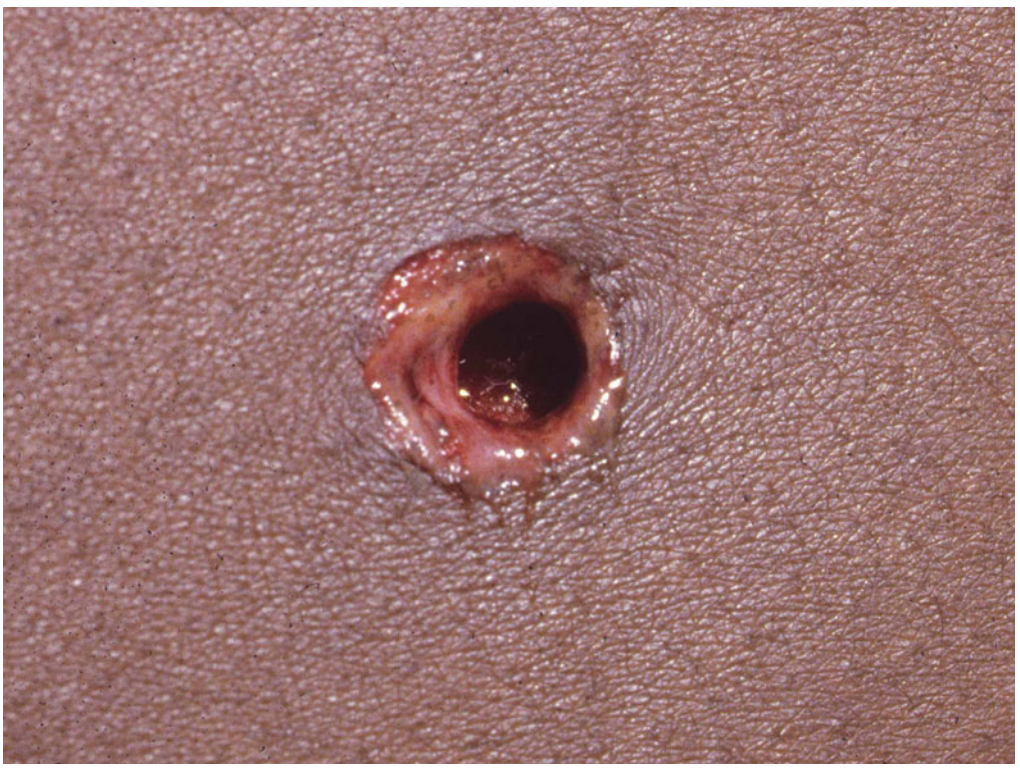

Fig. 13.23
A gunshot entrance wound. Note the central round defect (hole) and the surrounding marginal abrasion. There is no surrounding soot or gunpowder stippling, making this a distant (indeterminate) range entrance wound. Note that the marginal abrasion is wider on the left side, indicating that the bullet was coming more from the left, as opposed to straight-on

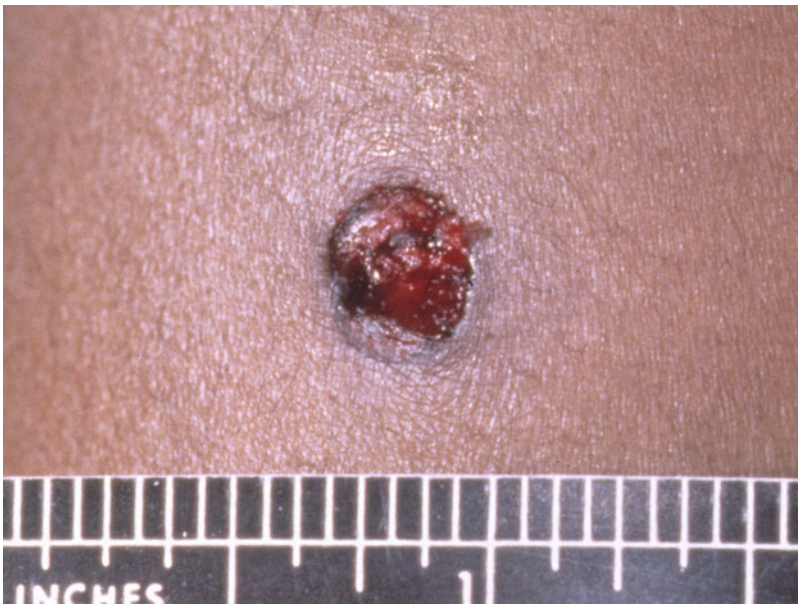

Fig. 13.24
An example of an angled gunshot entrance wound. The bullet entered the skin at an angle, with initial contact at approximately the 11 o'clock position, traveling downward and slightly to the right as viewed in the photo

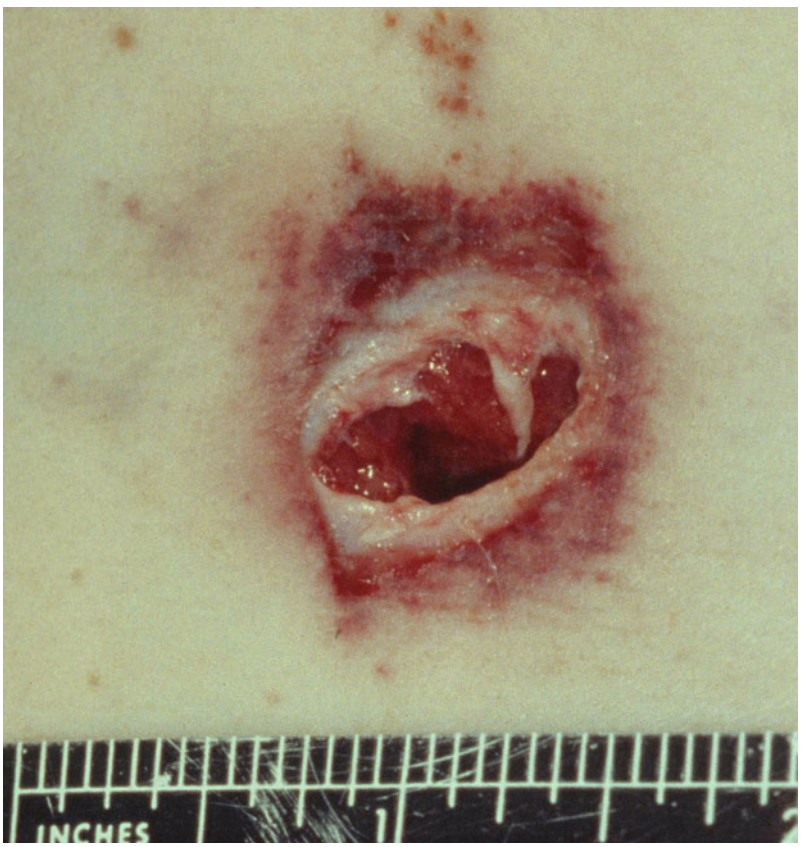

Fig. 13.25
An atypical gunshot entrance wound, characterized by a large size and relatively broad marginal abrasions. Such a wound typically occurs when the bullet has passed through an interposed target prior to striking the victim

Fig. 13.26
A bullet has entered and exited the arm and then reentered the left side of the thorax/back

Fig. 13.27
Fragmented bullet entrance wounds. If a bullet strikes an object prior to hitting a person, the bullet can fragment. Many times, the fragments maintain enough energy to enter the body

Fig. 13.28
An entrance wound of the thick (palmar) skin on the side of the hand. Note the presence of rare gunpowder stipple marks

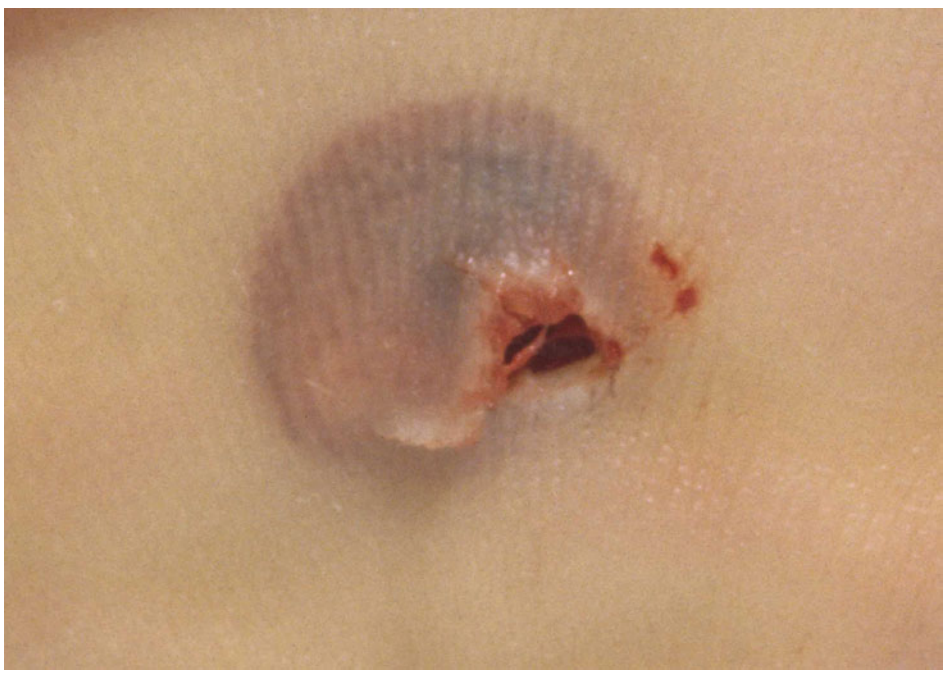

Fig. 13.29
An entrance wound of the thick skin on the sole of a foot. Entrance wounds on the thick skin of the palms and soles often have an appearance that mimics an exit wound, lacking the typical circumferential marginal abrasion that most entrance wounds demonstrate

Fig. 13.30
Contact entrance wound of the scalp (forehead), showing the characteristic stellate shape due to splitting of the skin because of gases having dissected between the skin and underlying skull bones. Note the central round defect, as well as the soot

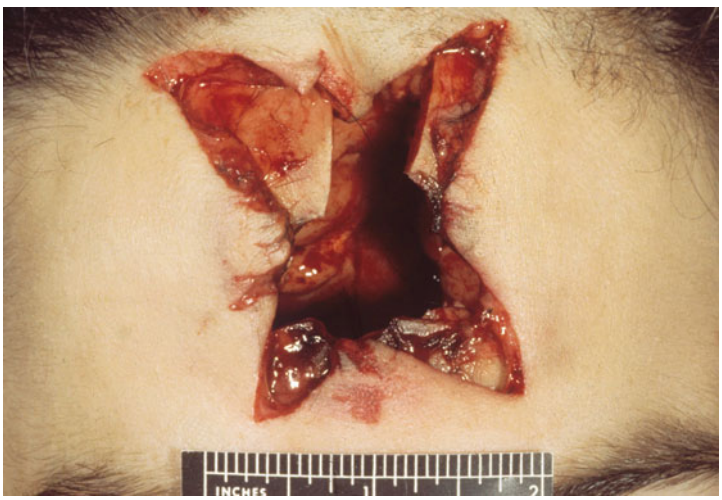

Fig. 13.31
A contact entrance wound of the head (forehead) showing wide separation of the wound edges

Fig. 13.32
Not all contact wounds of the head have classic, large, stellate lacerations. This image shows a contact 0.22 caliber gunshot wound of the head (temple). Note the presence of soot, but the absence of significant stellate lacerations

Fig. 13.33
Loose contact wound of the chest, with extensive soot deposited around the entrance site

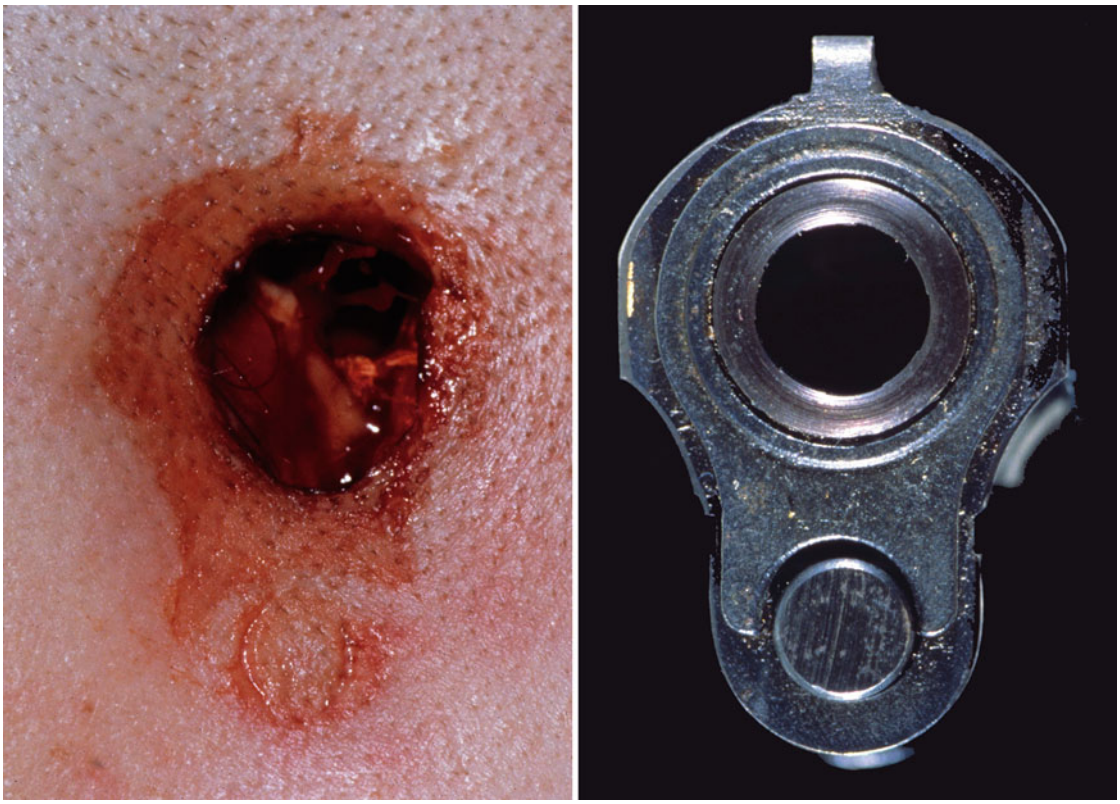

Fig. 13.34

(a) A contact entrance wound of the scalp, with a muzzle imprint abrasion. The explosive gases force the surrounding skin against the muzzle of the weapon, resulting in the imprint abrasion. (b) A view of the muzzle of the weapon used in this case

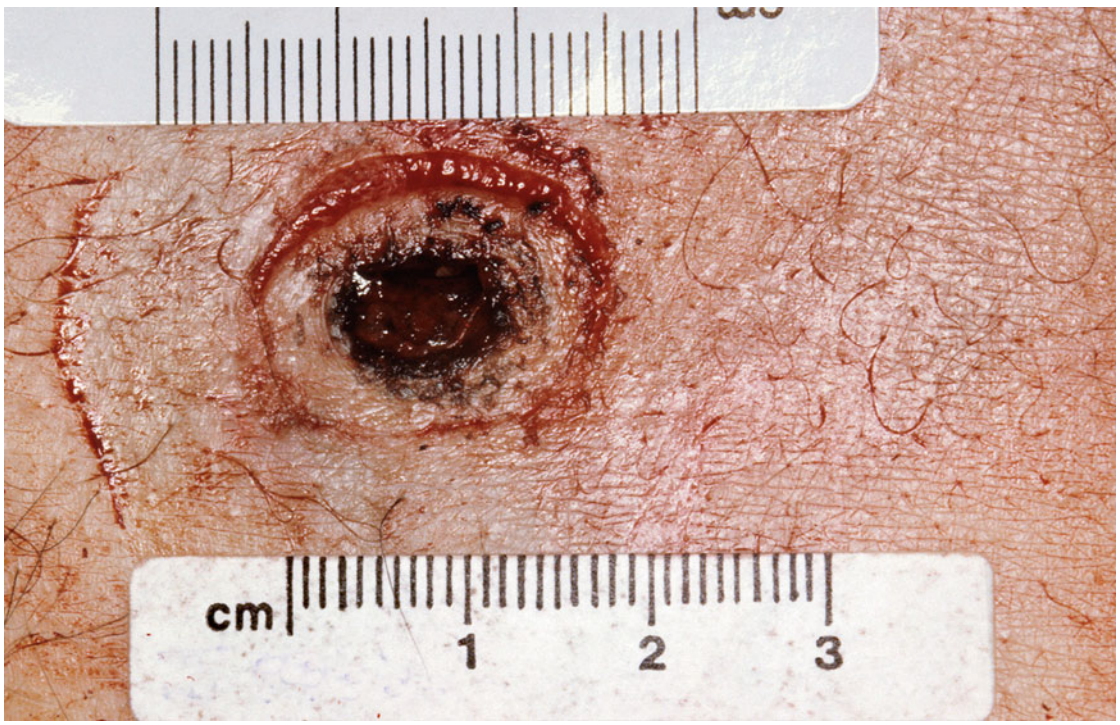

Fig. 13.35

A contact gunshot wound of the chest with a surrounding muzzle impression

Fig. 13.36
A contact gunshot wound of the neck. Note the surrounding subcutaneous bleeding (blue discoloration)

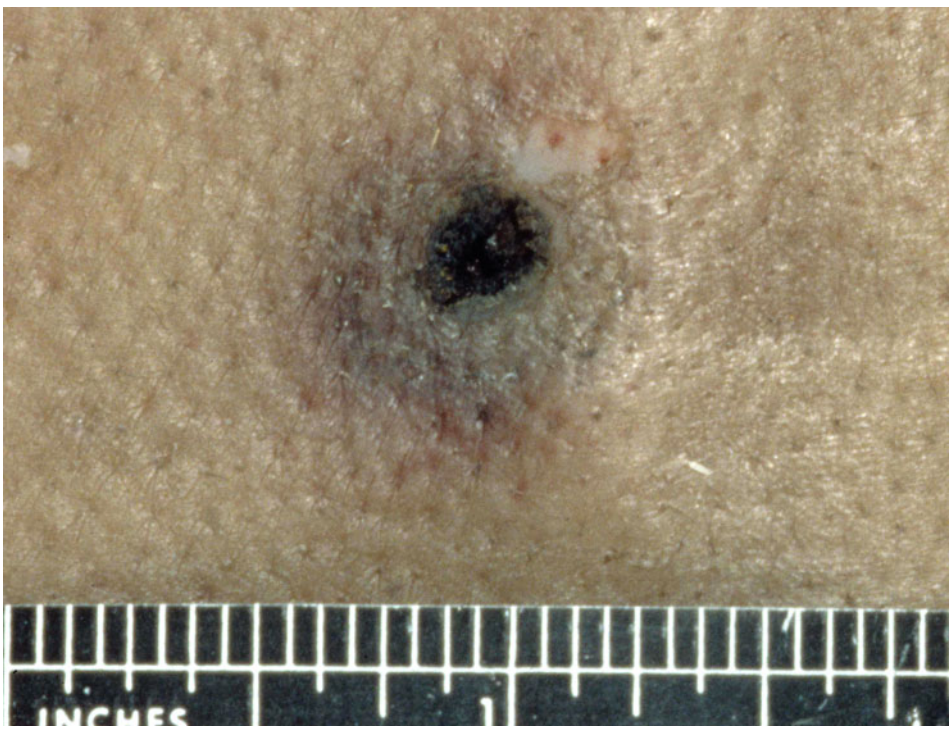

Fig. 13.37
Contact gunshot wound of the chest

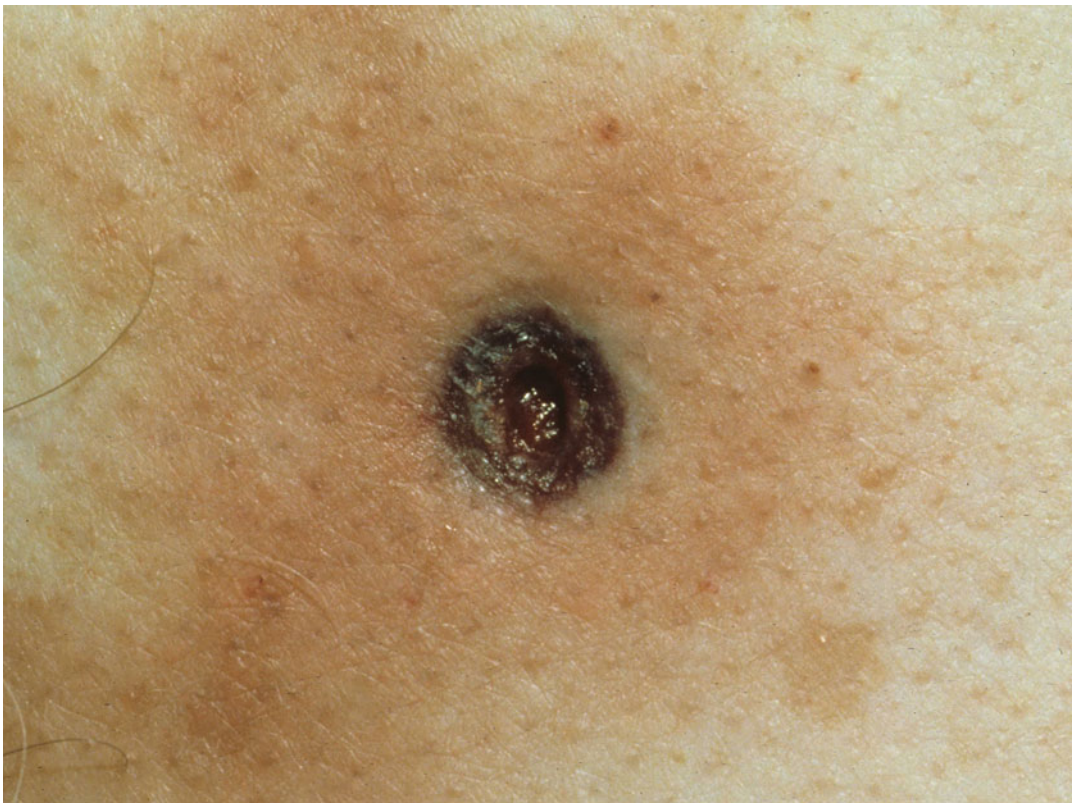

Fig. 13.38
Contact wound of the chest, with associated pink-red discoloration surrounding the wound, caused by the high carbon monoxide levels contained within the explosive gases of the gunshot discharge

Fig. 13.39
A characteristic site for suicide – a contact 0.22 caliber gunshot wound to the right temple with bruising of the soft tissues of the orbits

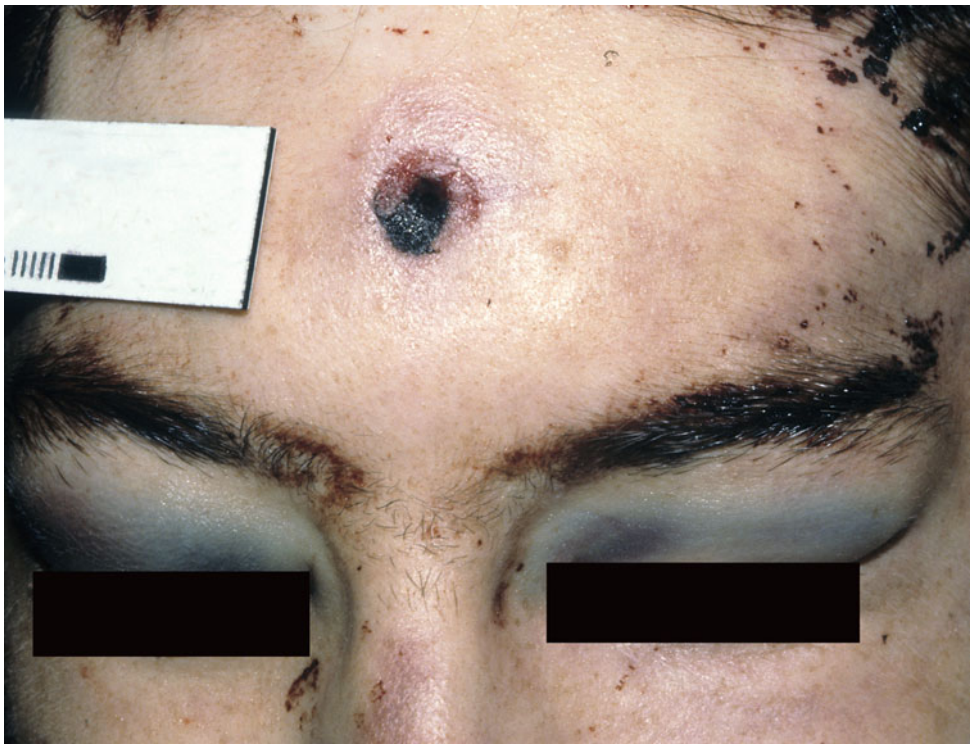

Fig. 13.40
Another characteristic site for suicide – a contact 0.22 caliber gunshot wound to the center of the forehead

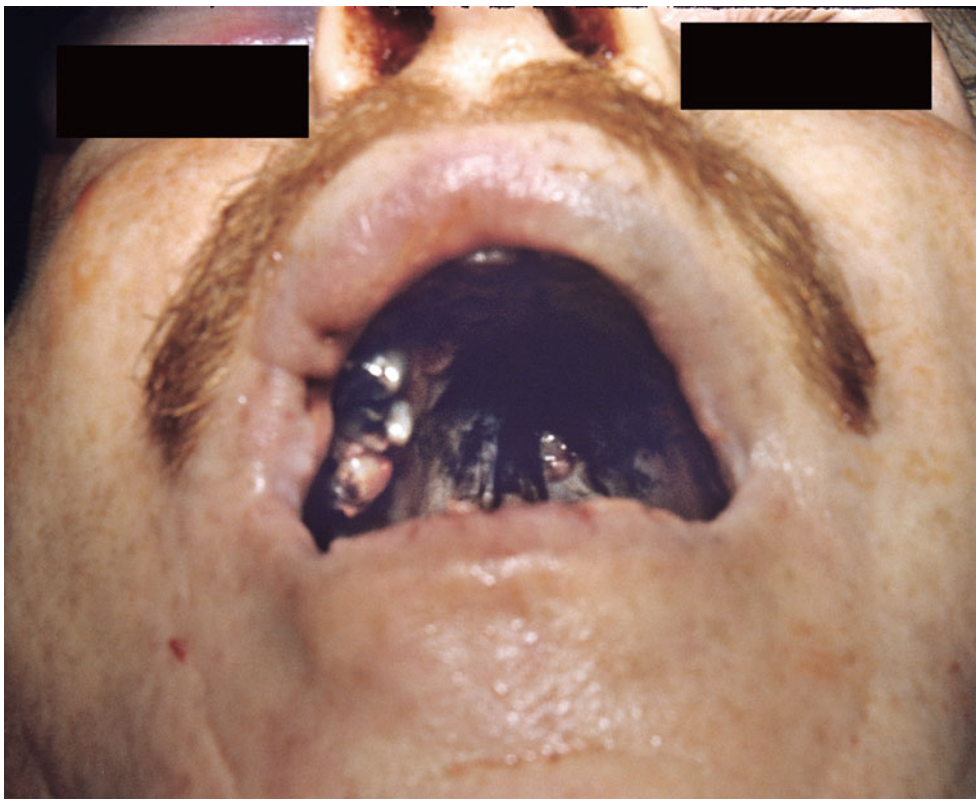

Fig. 13.41
Soot soiling of the roof of the mouth in a suicide. Intraoral gunshot wounds are also a favored entrance site in suicides

Fig. 13.42
An intraoral gunshot wound of the roof of the mouth viewed via a mirror that has been inserted into the open mouth. Note the muzzle imprint and soot deposition

Fig. 13.43
Multiple lip lacerations associated with an intraoral suicidal gunshot wound

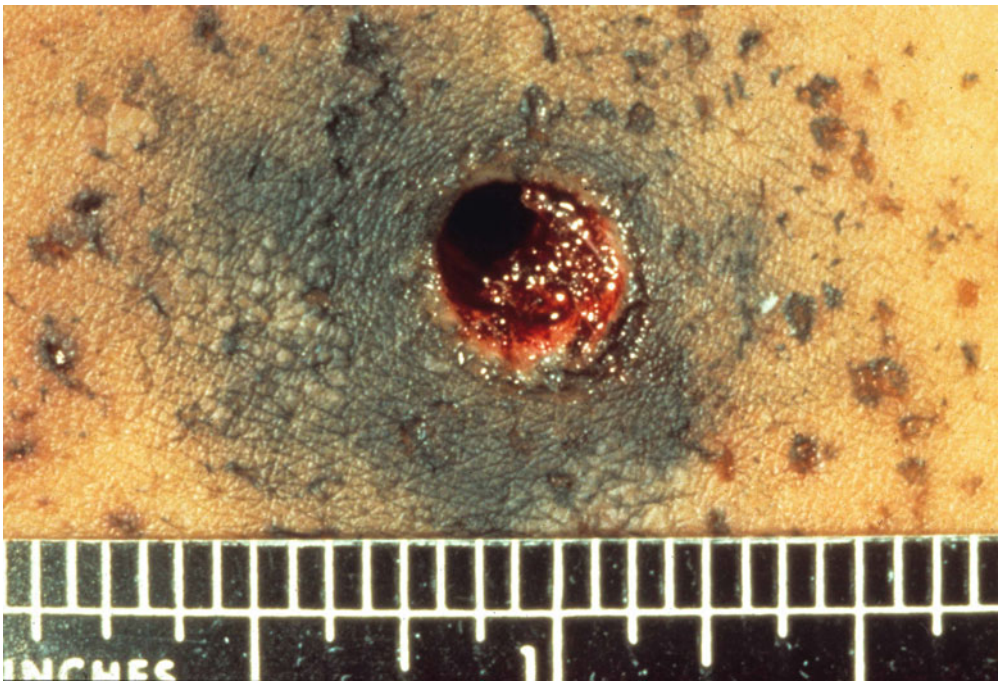

Fig. 13.44
A close-range gunshot wound, characterized by soot and gunpowder deposition. Such wounds typically occur when the muzzle of the weapon is within about 1 ft (12 in.) of the skin surface

Fig. 13.45
A close-range gunshot entrance wound with soot and stippling

Fig. 13.46
An article of clothing demonstrating soot deposition. It is important to examine the clothing of persons who have sustained gunshot injuries. In this case, the defect in the clothing has been moved away from the underlying gunshot wound in order to better visualize the soot

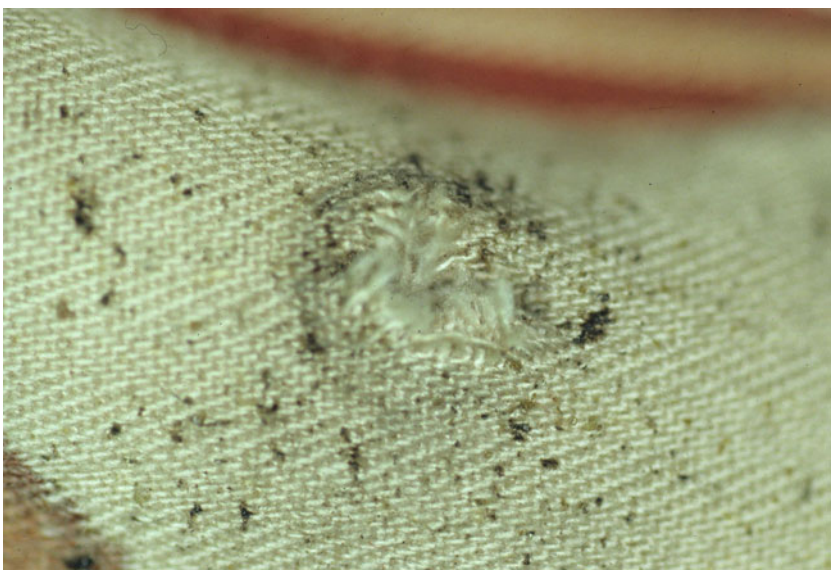

Fig. 13.47
An article of clothing with gunpowder deposition

Fig. 13.48
A medium (intermediate) range gunshot wound, characterized by gunpowder stippling, but no soot. These wounds typically occur when the muzzle of the weapon is from 1 to about 3 ft from the skin surface

Fig. 13.49
A medium (intermediate) range gunshot entrance wound with surrounding stippling

Fig. 13.50
Symmetrical stippling around an intermediate gunshot wound to the right side of the chest in a homicide. The symmetric pattern indicates that the bullet entered from a relative "straight-on" direction

Fig. 13.51
Symmetrical stippling around an intermediate homicidal gunshot wound to the left side of the chin

Fig. 13.52
Elliptical tattooing around an intermediate 0.45 caliber gunshot wound to the left chest, indicating an oblique angle of entrance

Fig. 13.53
Another angled entrance wound with more dense stippling on the skin closest to the gun (toward the right), and less dense stippling away from the gun (lower left). Note that the stippling extends a greater distance on the side opposite the gun

Fig. 13.54
A medium-range gunshot wound, where much of the gunpowder stippling has been blocked by hair on the upper right side of the image (it has been shaved at autopsy)

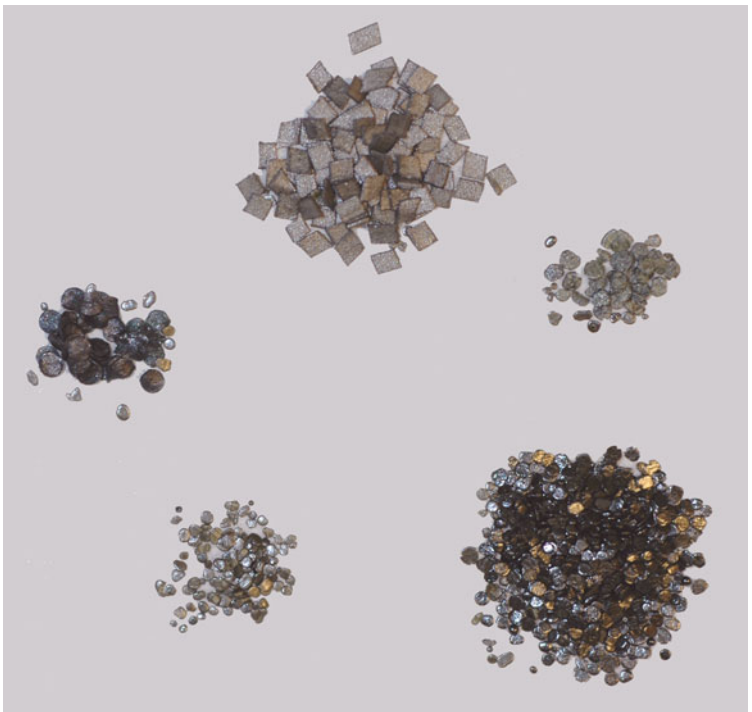

Fig. 13.55
Examples of different gunpowder types from five different cartridges

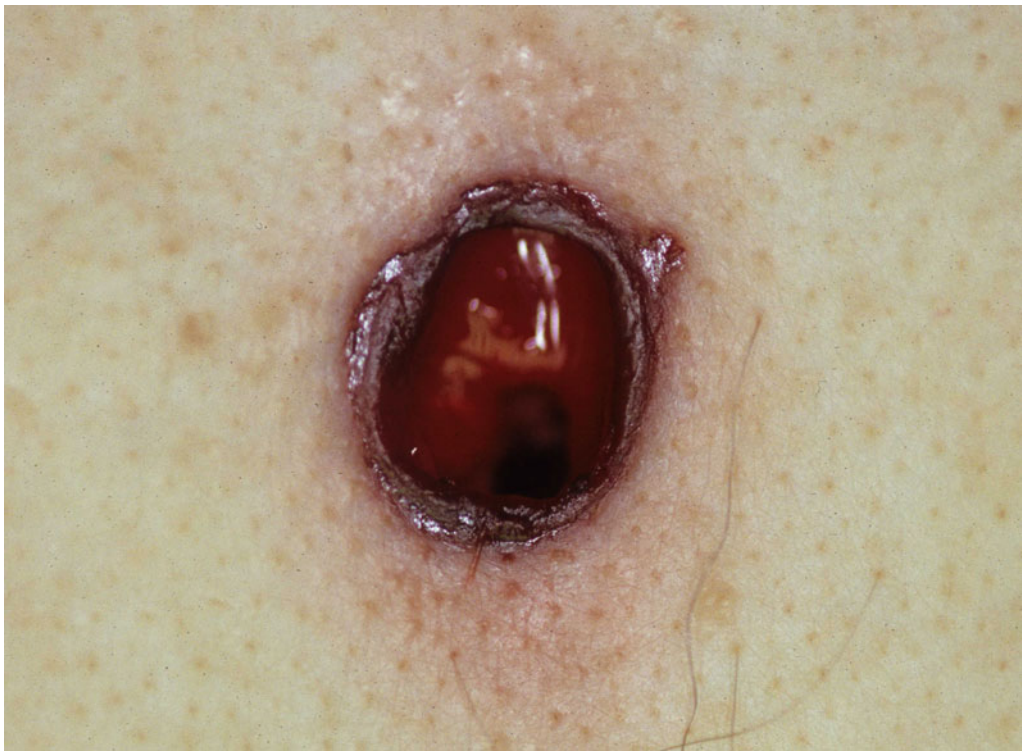

Fig. 13.56
Dark discoloration of the margins of an entrance wound caused by postmortem drying. This can be misinterpreted as soot

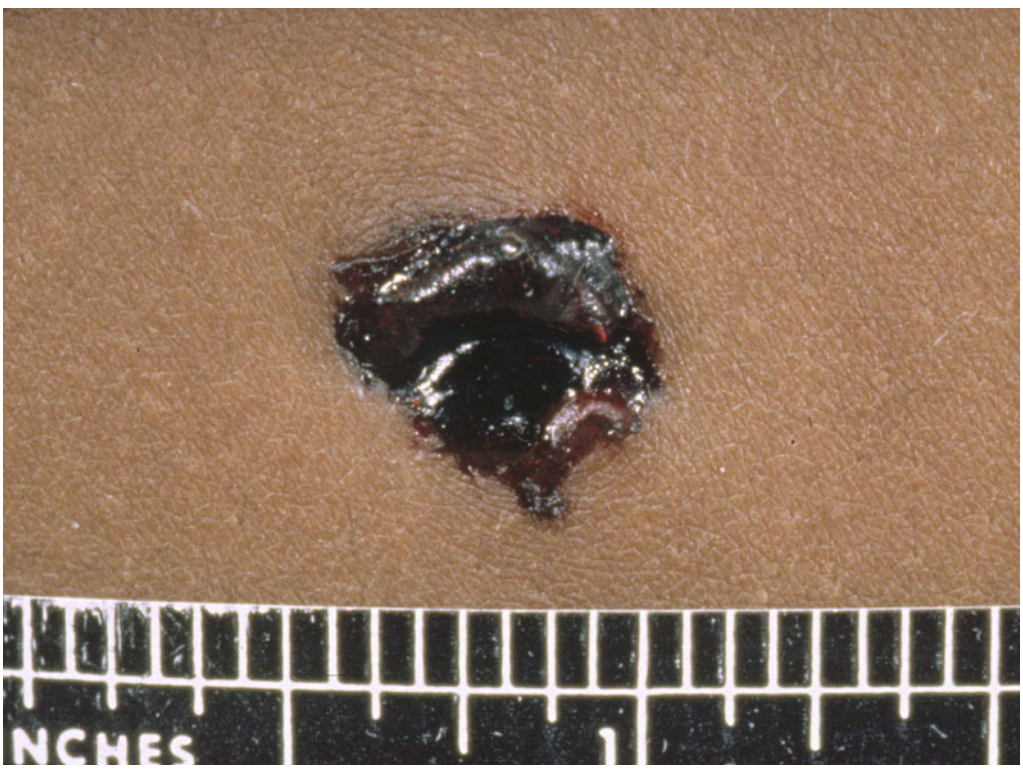

Fig. 13.57
Another example of a noncontact gunshot entrance wound, with drying of the marginal abrasion

Fig. 13.58
A gunshot entrance wound with surrounding stipple marks produced by fragments of an interposed target. Note the atypical appearance of the entrance wound, characteristic of a wound caused by a projectile that has gone through another object prior to hitting the body

Fig. 13.59
A stellate exit wound. Note the absence of a central round defect (a feature which is characteristic of an entrance wound). Exit wounds tend to be of irregular shape. They may or may not have a central round defect, and they usually lack circumferential marginal abrasions

Fig. 13.60
An irregularly shaped exit wound. Note the absence of marginal abrasions

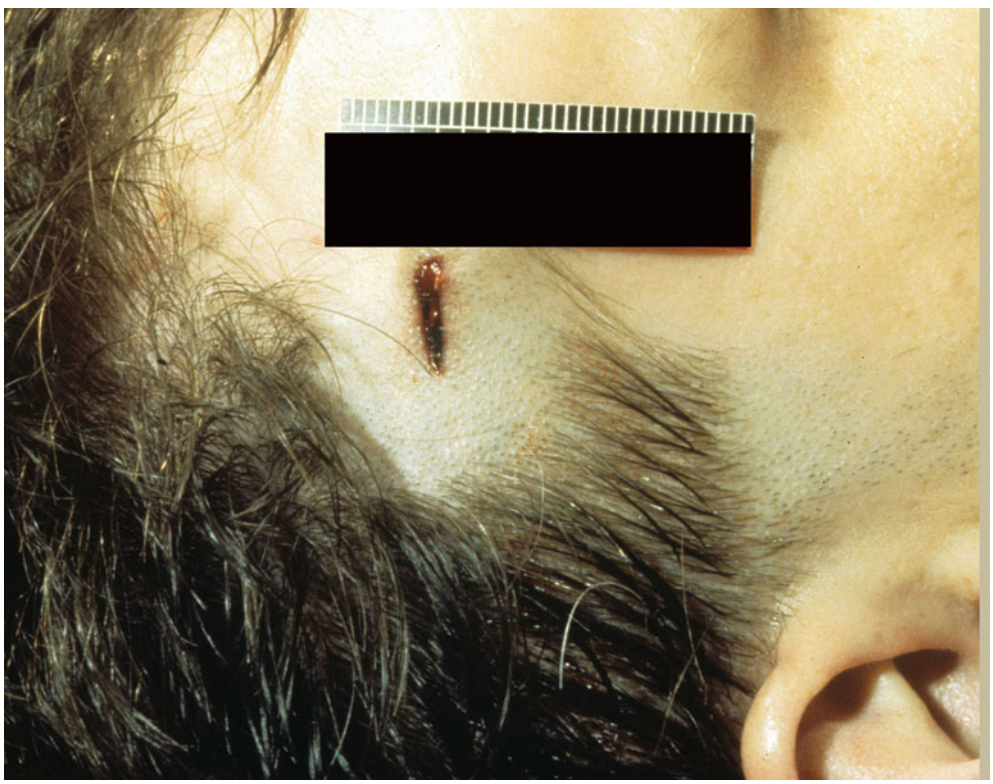

Fig. 13.61
A slit-like gunshot exit wound

Fig. 13.62
A comma-shaped gunshot exit wound

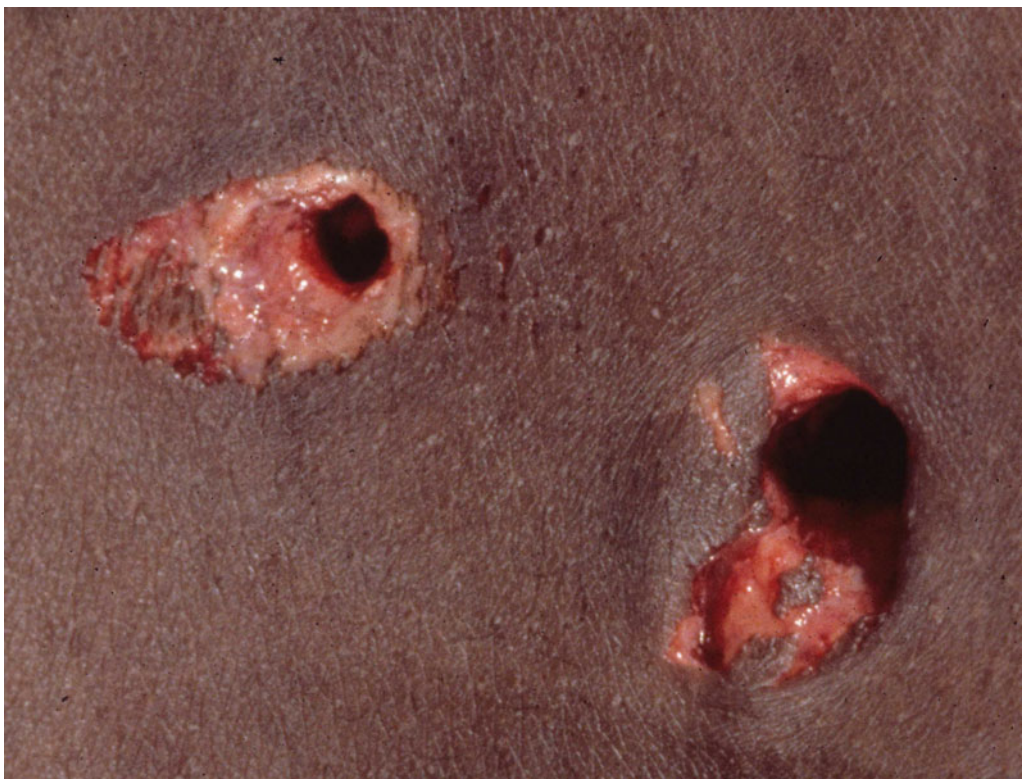

Fig. 13.63
An angled gunshot entrance wound (left) adjacent to an unrelated gunshot exit wound (right). Note that, although the exit wound has a central round- to oval-shaped defect, it lacks a marginal abrasion

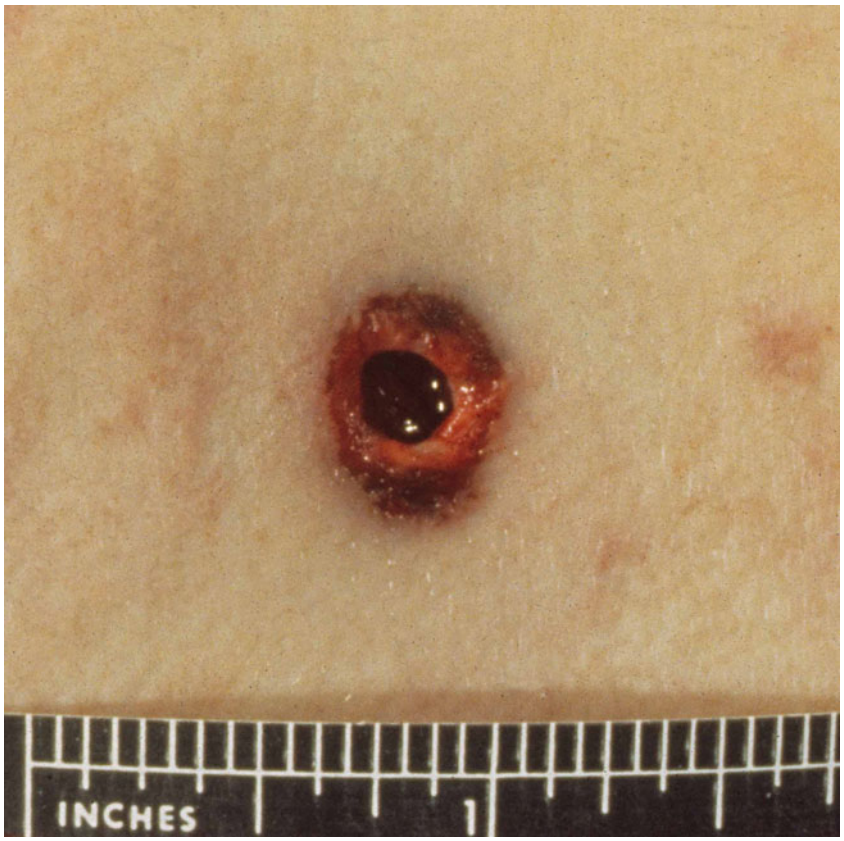

Fig. 13.64
A shored exit wound where the decedent had been leaning against a supporting surface at the site of the exit wound. This prevents the typical irregular lacerations and mimics an entrance wound because the wound contains a circumferential marginal abrasion

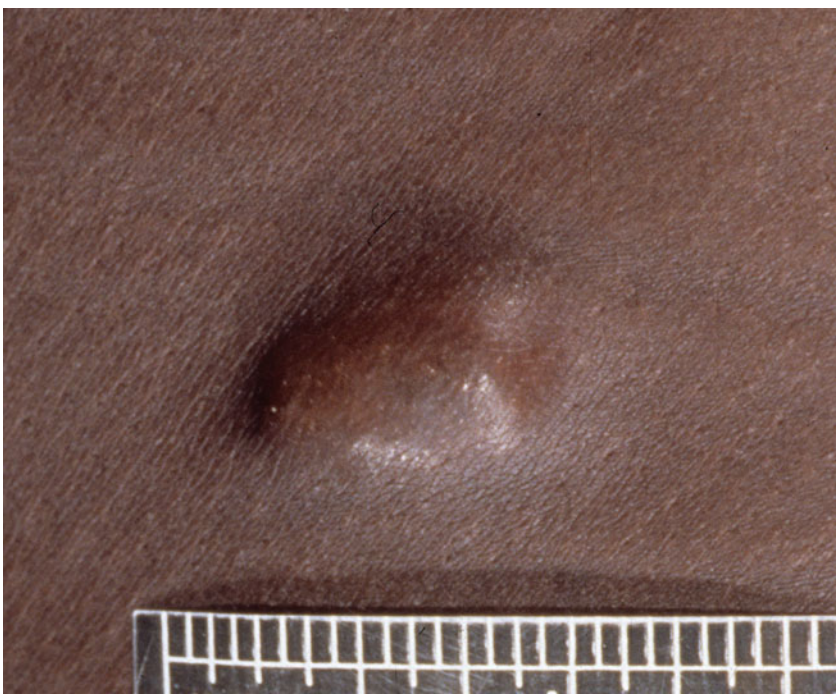

Fig. 13.65
A bullet located just beneath the skin surface

Fig. 13.66
A partial gunshot exit wound of the neck, where the copper-jacketed bullet protrudes through the skin (*arrow*)

Fig. 13.67
An area of subcutaneous hemorrhage indicating the location of a subcutaneous bullet

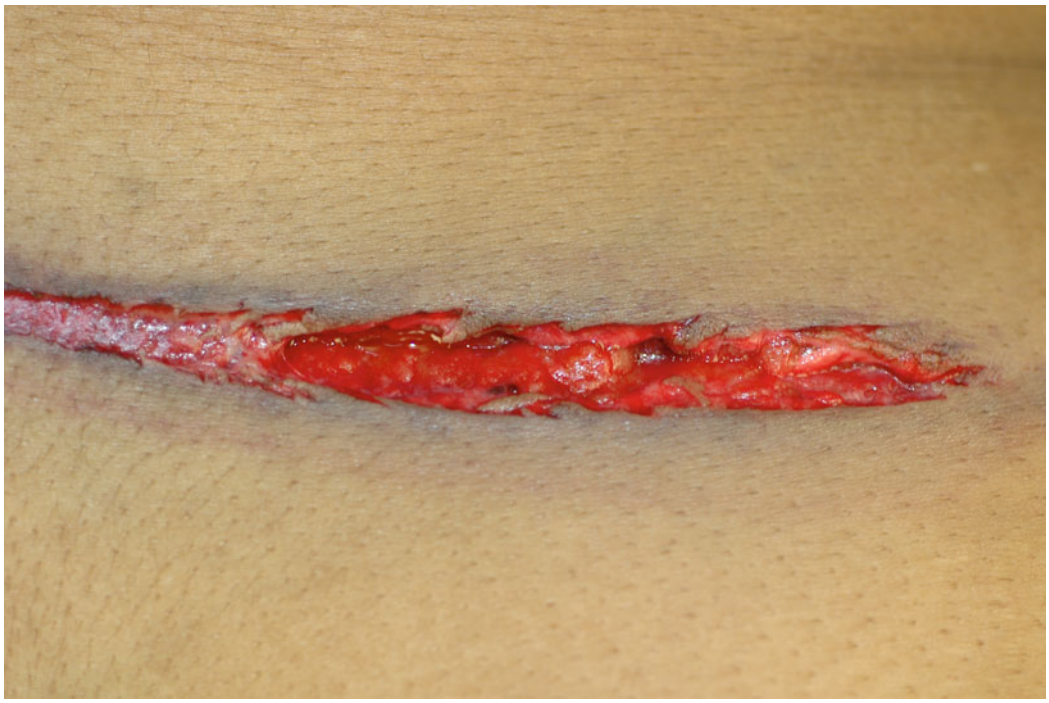

Fig. 13.68
A graze gunshot wound. The direction of bullet travel was from left to right. Note that the tips (pointed ends) of the skin "flaps" on the margins (upper and lower edges) point toward the gun

Fig. 13.69
A graze gunshot wound with the direction of travel of the bullet from right to left

Fig. 13.70
A graze wound of the hand from a 7.65 mm automatic

Fig. 13.71
An L-shaped cylinder-barrel gap mark, produced by gunshot residue being expelled from the cylinder barrel gap of a revolver (refer to *Fig. 13.10*)

Fig. 13.72
An injury to the hand of a shooter caused by the slide of a semiautomatic pistol

Fig. 13.73
Soot present on the hand of a gunshot suicide victim

Fig. 13.74
A high-velocity entrance wound. Note the relative absence of a marginal abrasion and the presence of numerous marginal microlacerations

Fig. 13.75
A distant-range, high-velocity entrance wound of the scalp with relatively extensive marginal lacerations

Fig. 13.76
High-velocity exit wounds, with extensive tissue damage

Fig. 13.77
A high-velocity rifle wound injury complex of the legs. The small entrance wound is just visible on the outside edge of the right thigh (left side of photograph – marked with an *arrowhead*). The large exit wound involves the inner aspect of the right thigh. Finally, there are multiple reentrance wounds from bullet fragments located on the inner aspect of the left thigh

Fig. 13.78
A closer view of the small high-velocity entrance wound shown in *Fig. 13.77*

Fig. 13.79
A closer view of the large high-velocity exit wound shown in *Fig. 13.77*

Fig. 13.80
A suicidal contact high-velocity rifle wound of the chin, with a massive exit wound complex of the left side of the face

Fig. 13.81
A contact high-velocity entrance wound of the chest

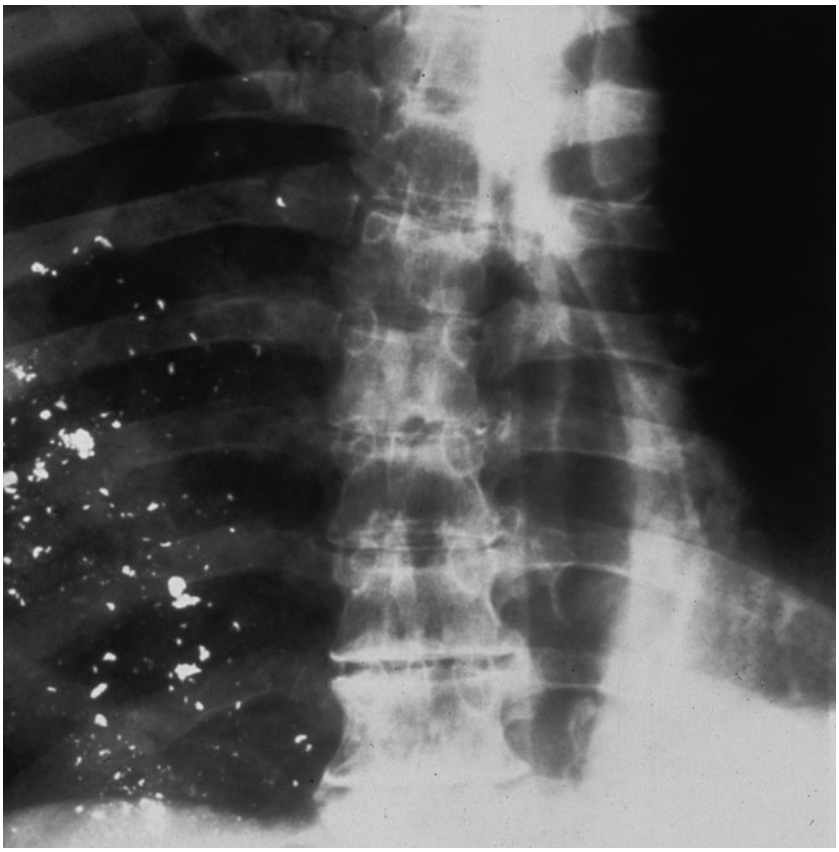

Fig. 13.82
The characteristic "lead snowstorm" X-ray associated with a high-velocity projectile (typically hunting ammunition)

Fig. 13.83
A contact shotgun wound of the forehead, with massive destruction

Fig. 13.84
Destruction of most of the head from a contact shotgun wound

Fig. 13.85
Destruction of most of the head from a contact shotgun wound with preservation of the avulsed brain (next to the shotgun in the foreground)

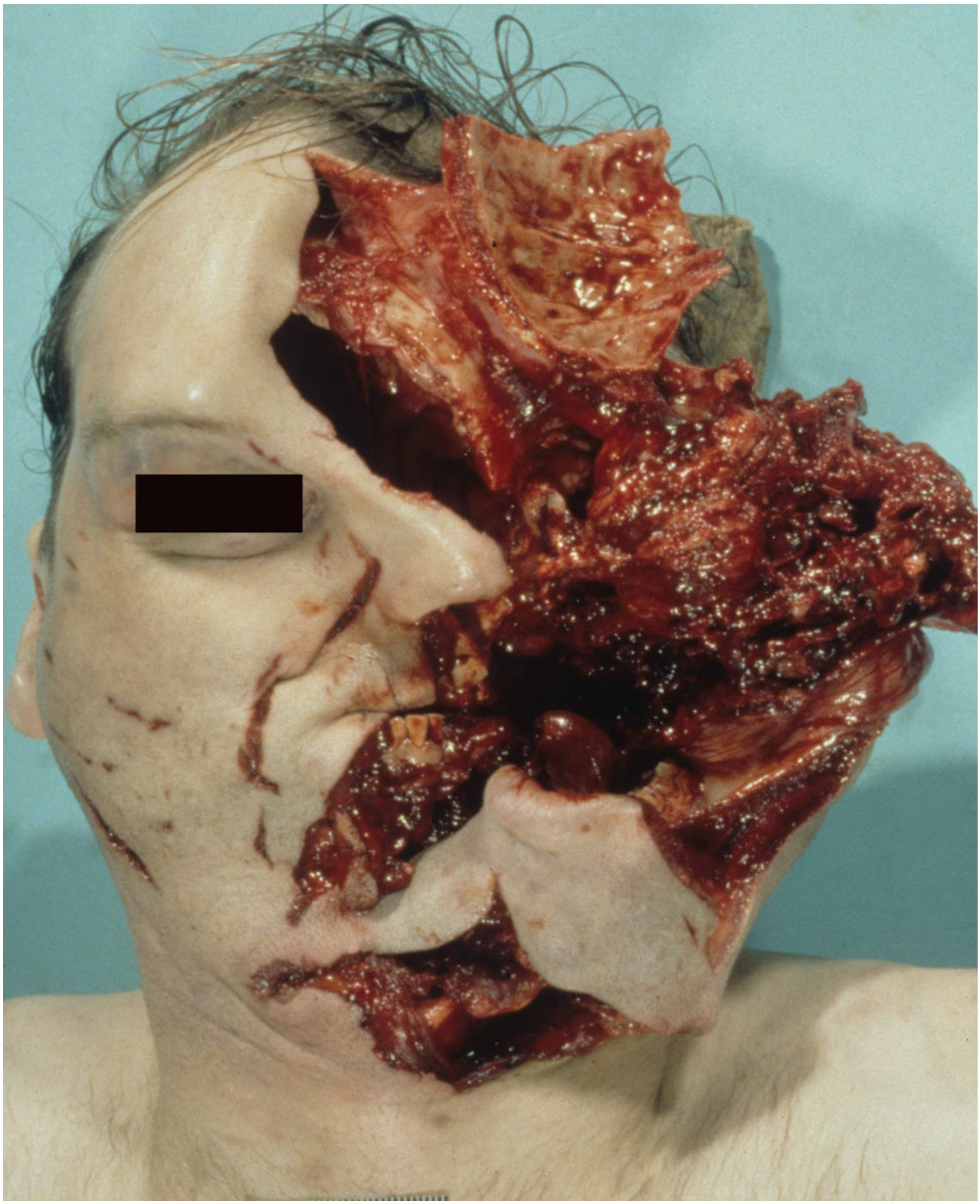

Fig. 13.86
A contact shotgun wound of the lower chin. Note the stretch-type lacerations of the right side of the face

Fig. 13.87
Lacerations of the corners of the mouth and stretch-type lacerations of the cheek, related to a contact shotgun wound of the lower chin

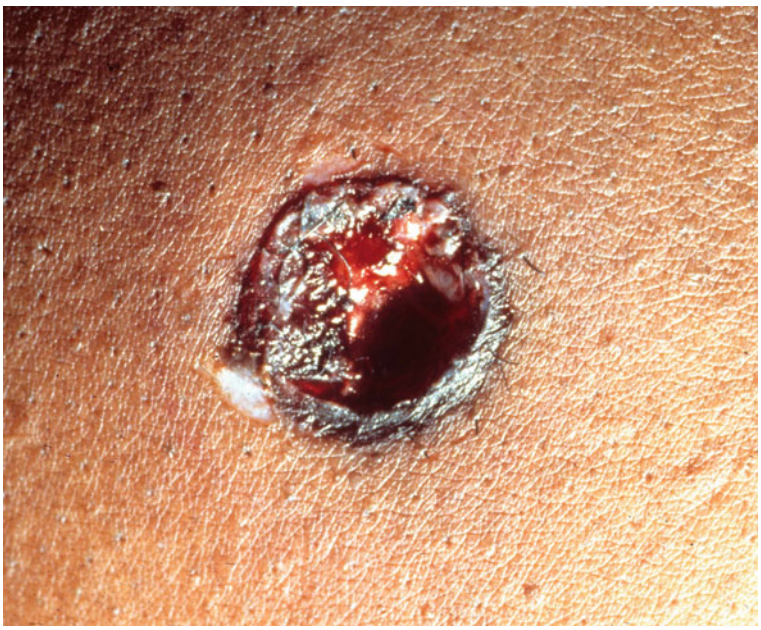

Fig. 13.88
A contact shotgun wound of the chest

Fig. 13.89
Contact shotgun wound of the chest from a double-barrel shotgun, with a muzzle imprint abrasion

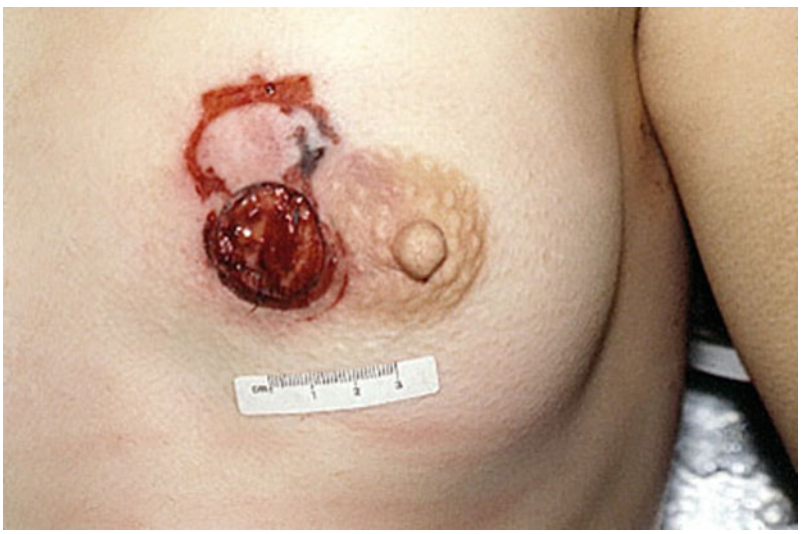

Fig. 13.90
Contact wound of the left breast from a double barrel 0.12 gauge shotgun with a muzzle impression from the non discharged barrel above

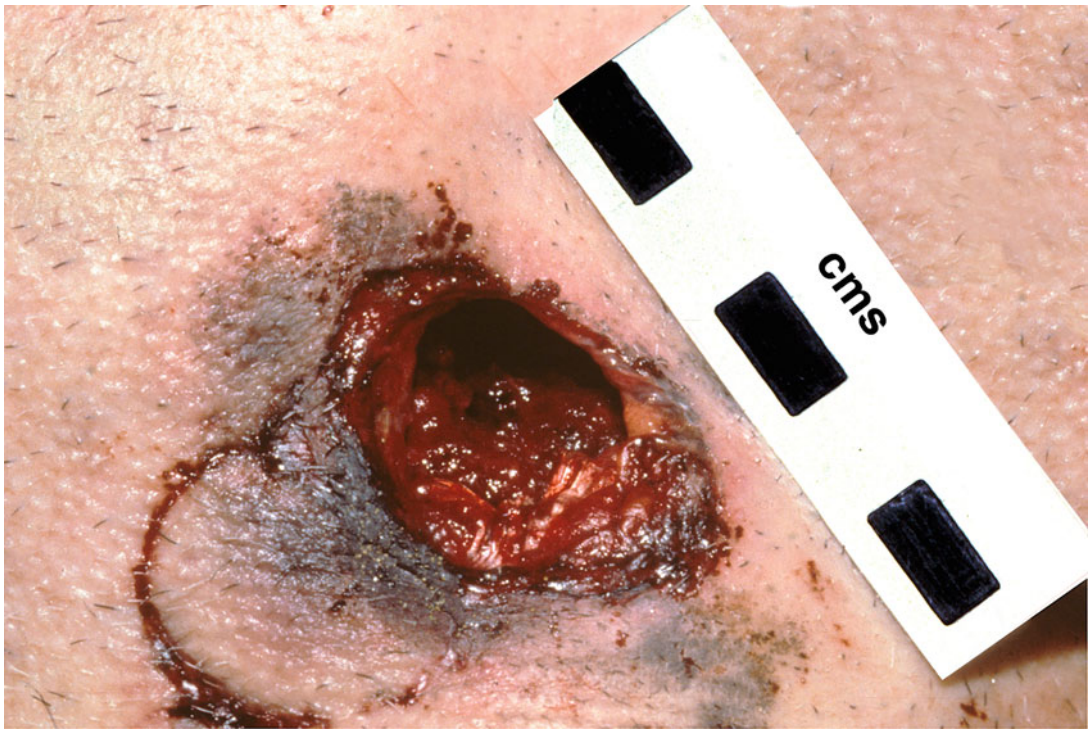

Fig. 13.91
Contact wound from a double barrel 0.12 gauge shotgun with soot soiling and a muzzle impression from the non discharged barrel

Fig. 13.92
Extensive stipple marks related to shotgun filler material from a buckshot charge. Note the presence of the small white filler material within and around the entrance defect

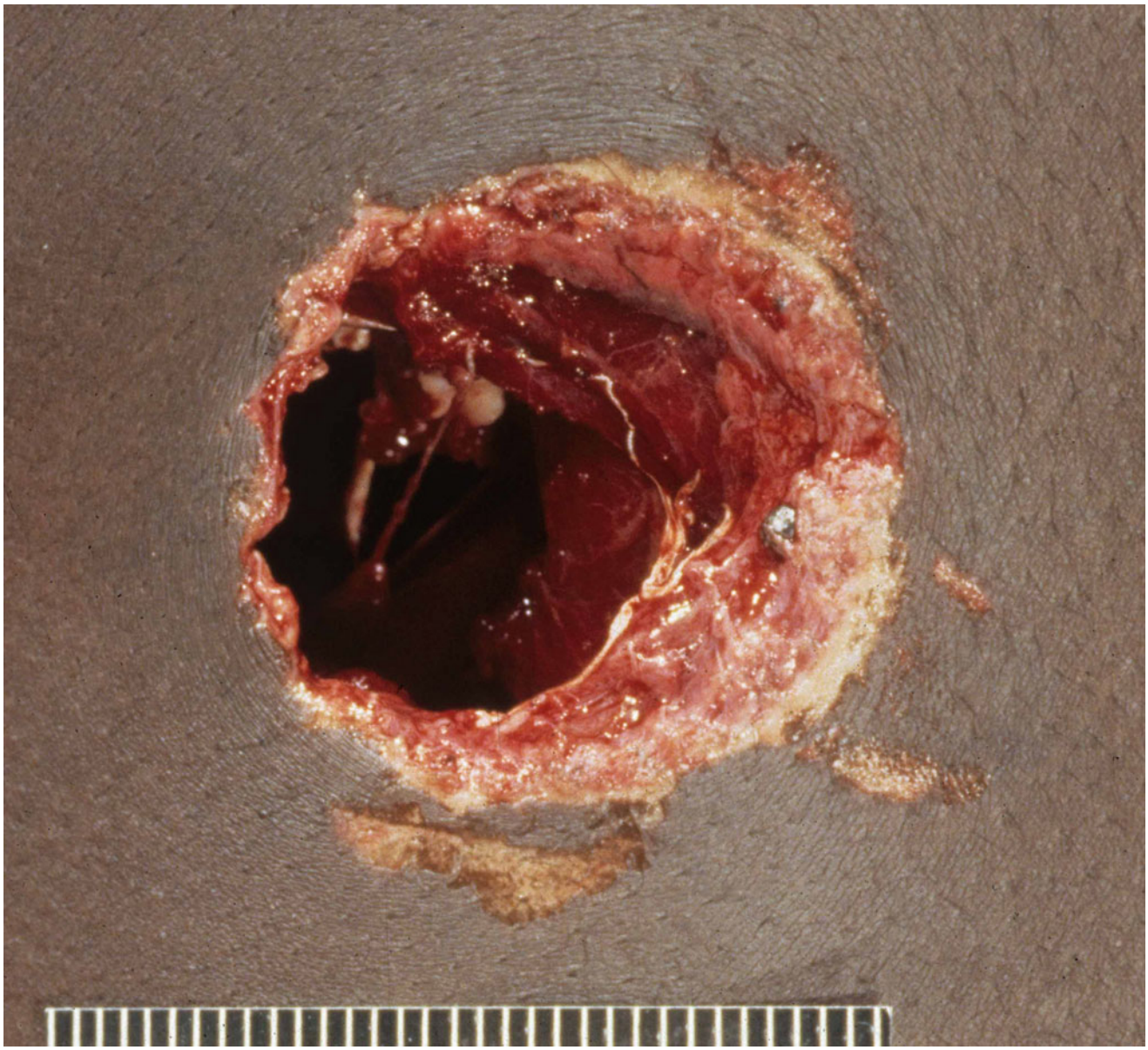

Fig. 13.93

A shotgun wound with ''scalloped'' margins, indicating that the mass of shot pellets remained relatively tightly packed when they struck the skin. Note also the irregular abrasion adjacent to the central defect caused by plastic wad material

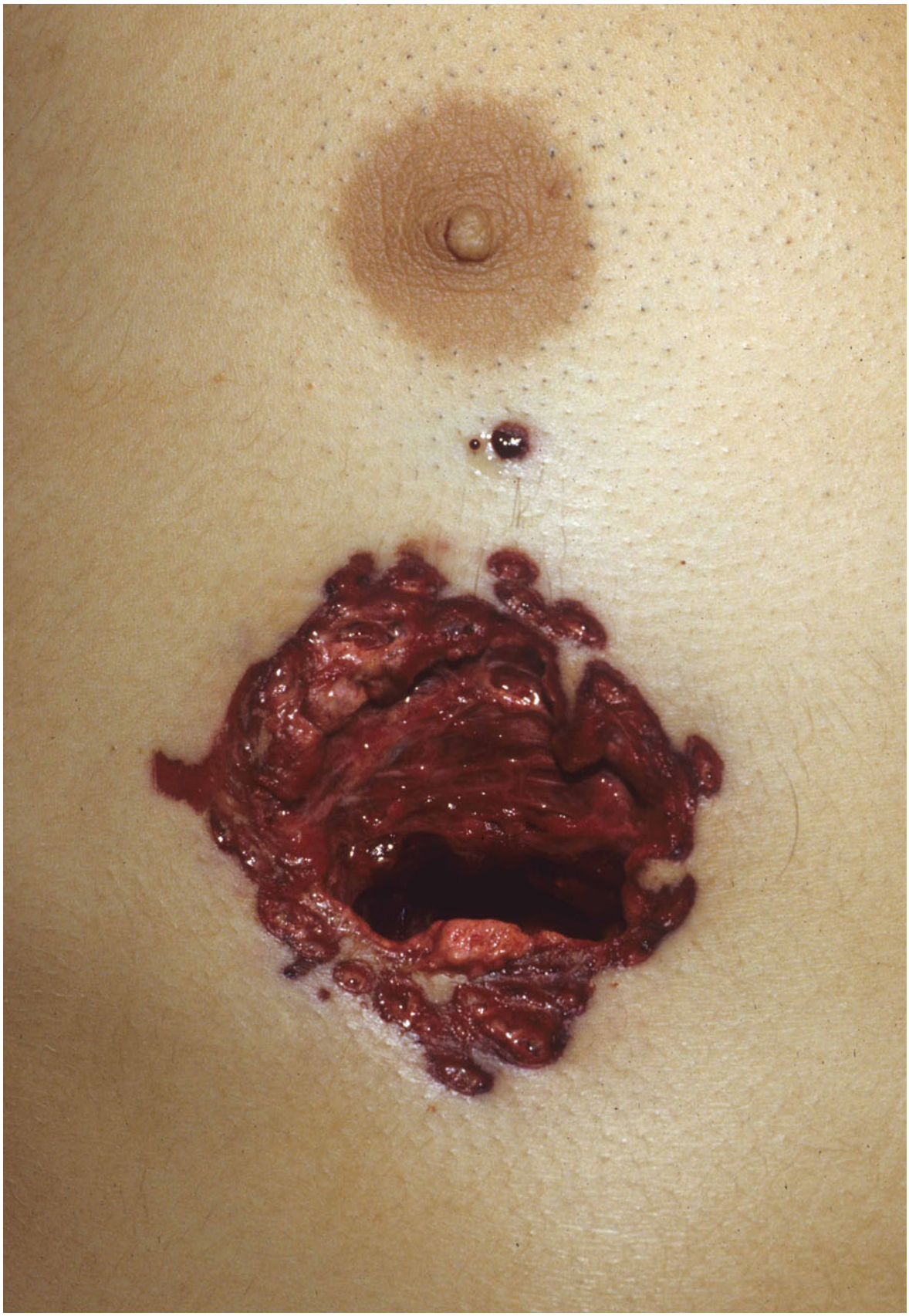

Fig. 13.94
A shotgun wound with a central defect, as well as occasional satellite pellet wounds

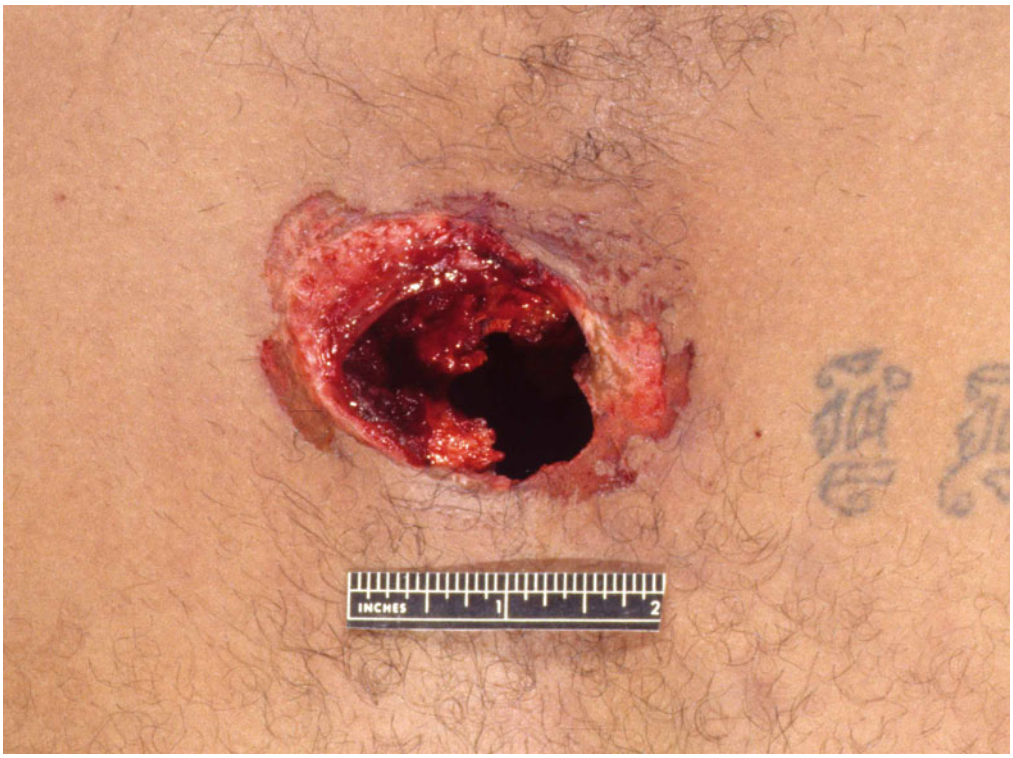

Fig. 13.95
A shotgun entrance wound with petal strike marks from wadding evident along the wound's margins (similar to that seen in *Fig. 13.93*)

Fig. 13.96
Shotgun wadding petal marks on the skin around an entrance wound. In this case, the plastic wadding had very firm petals, thus causing very well-defined abrasions

Fig. 13.97
Petal marks from shotgun wadding around an entrance wound of the scalp only revealed once the hair had been shaved

Fig. 13.98
A shotgun wad strike mark, with the wadding material adjacent to the injury. The photo was taken prior to shaving beard hair from around the pellet entry site, which is in the central neck (Photo courtesy of Dr. Patrick Lantz, MD, Department of Pathology, Wake Forest University School of Medicine, Winston-Salem, NC)

Fig. 13.99
A shotgun entrance wound with a central defect and numerous individual pellet entrances

Fig. 13.100
A shotgun wound with a central defect surrounded by numerous satellite pellet entrance wounds. The upper arm was also involved

Fig. 13.101
A shotgun entrance wound complex, with absence of a central defect. The shot pellets have spread apart prior to striking the body

Fig. 13.102
Buckshot entrance wounds

Fig. 13.103
A cluster of entrance wounds in the left side of the chest from a 0.12 gauge shotgun using 00 buckshot

Fig. 13.104
A homicide victim with three shotgun wounds of the back. All were fired from the same weapon at a similar range. Both bird and buckshot were used (Courtesy of the Dallas County Medical Examiners Office, Jeffrey J. Barnard, Chief Medical Examiner)

Fig. 13.105
Three buckshot exit wounds: one just under the nose and two on the chin. Note that the exit wounds mimic those caused by handgun bullets

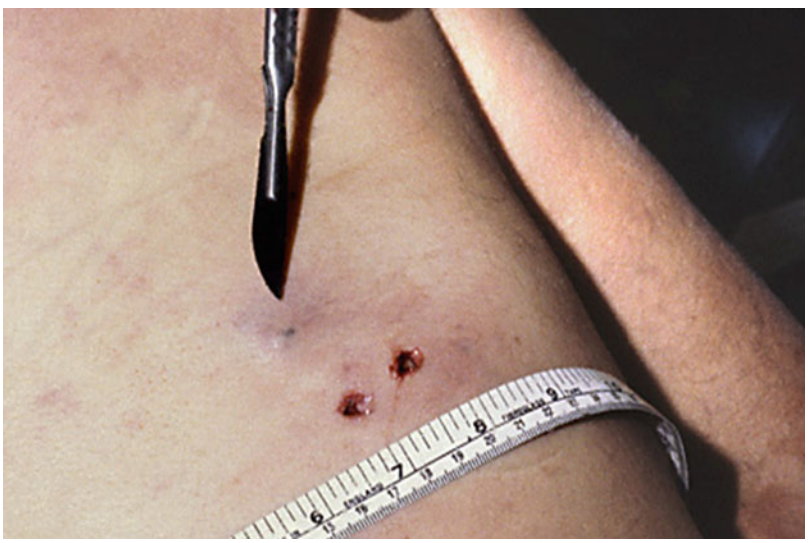

Fig. 13.106
Shotgun pellets located immediately beneath the skin of the back

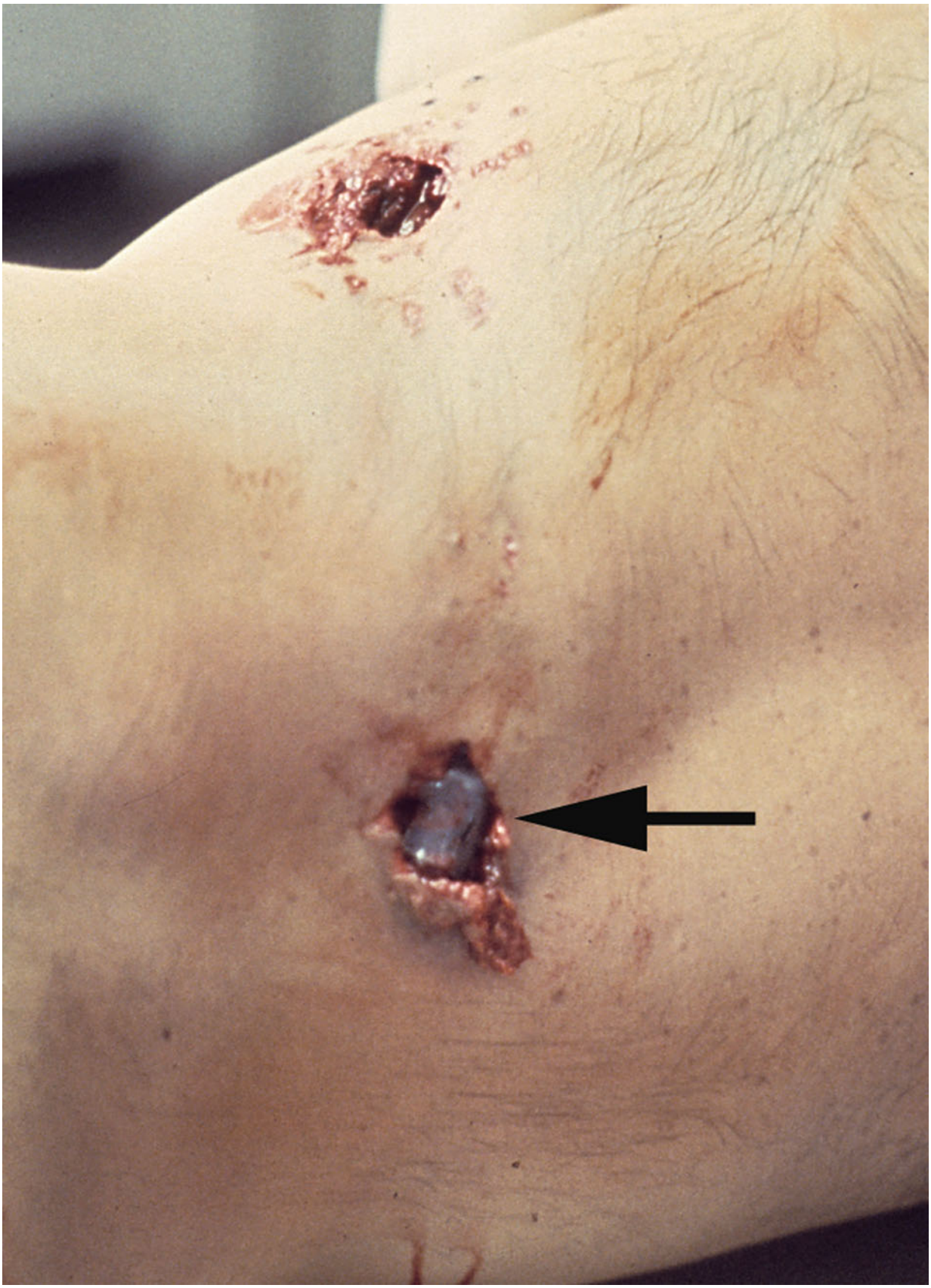

Fig. 13.107
Plastic wadding can be seen plugging a shotgun exit wound of the back

Fig. 13.108
The typical appearance of a birdshot shotgun wound X-ray

Fig. 13.109
A noncontact shotgun slug wound of the head with massive destruction

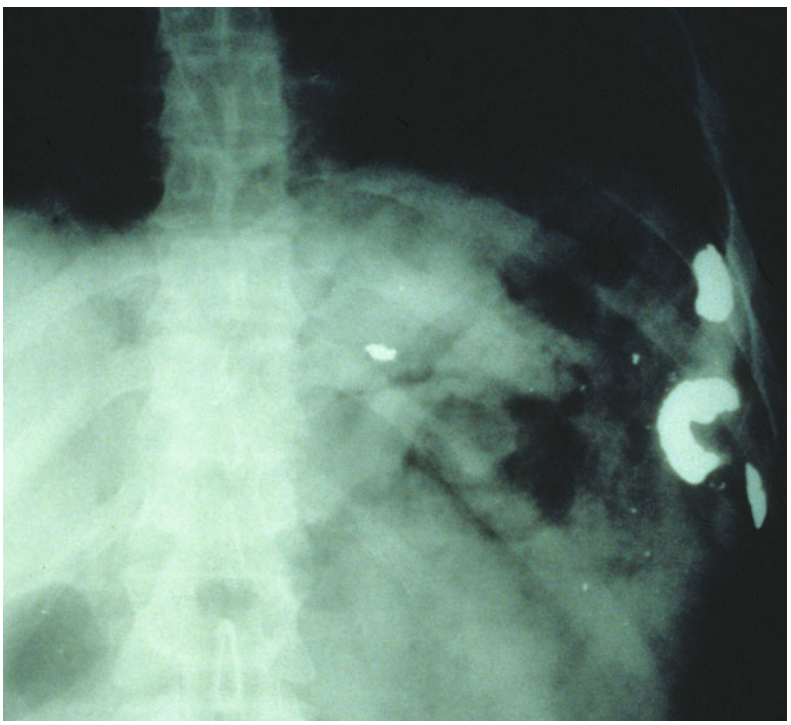

Fig. 13.110
Shotgun slug fragments as seen on X-ray. Note the "C"-shape of the largest fragment

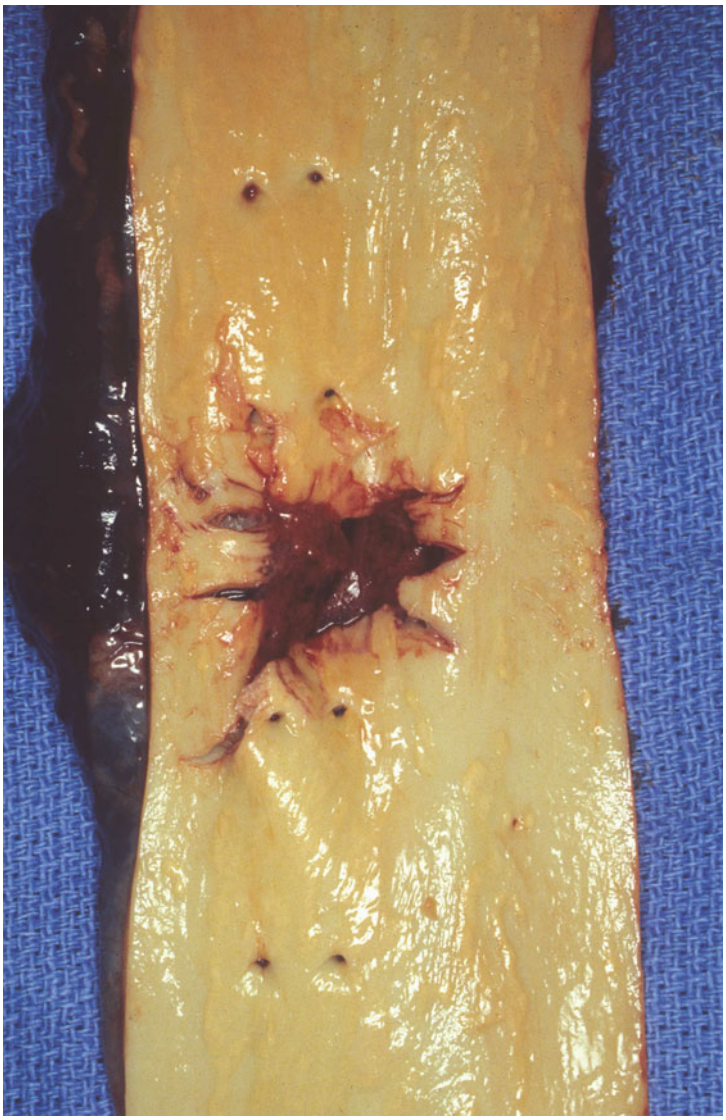

Fig. 13.111
A gunshot wound of the aorta

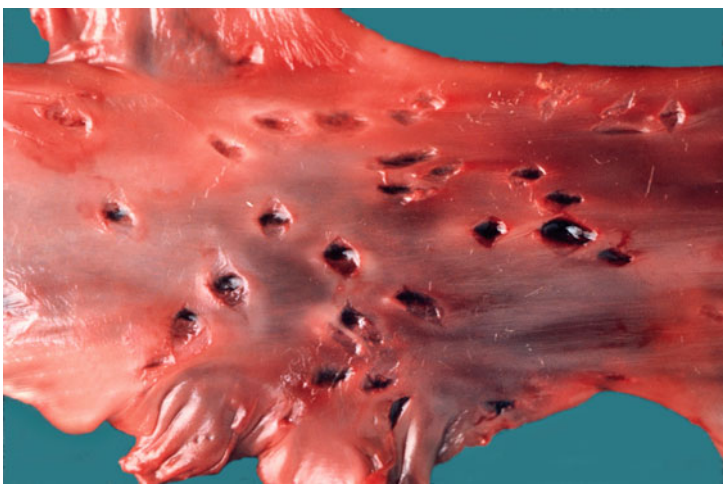

Fig. 13.112
Multiple shotgun pellet wounds of a large blood vessel

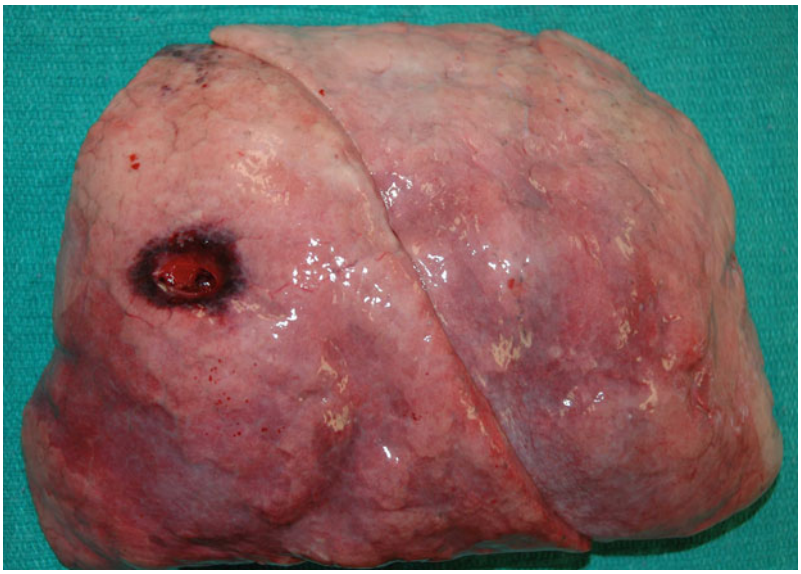

Fig. 13.113
A gunshot wound of the lung

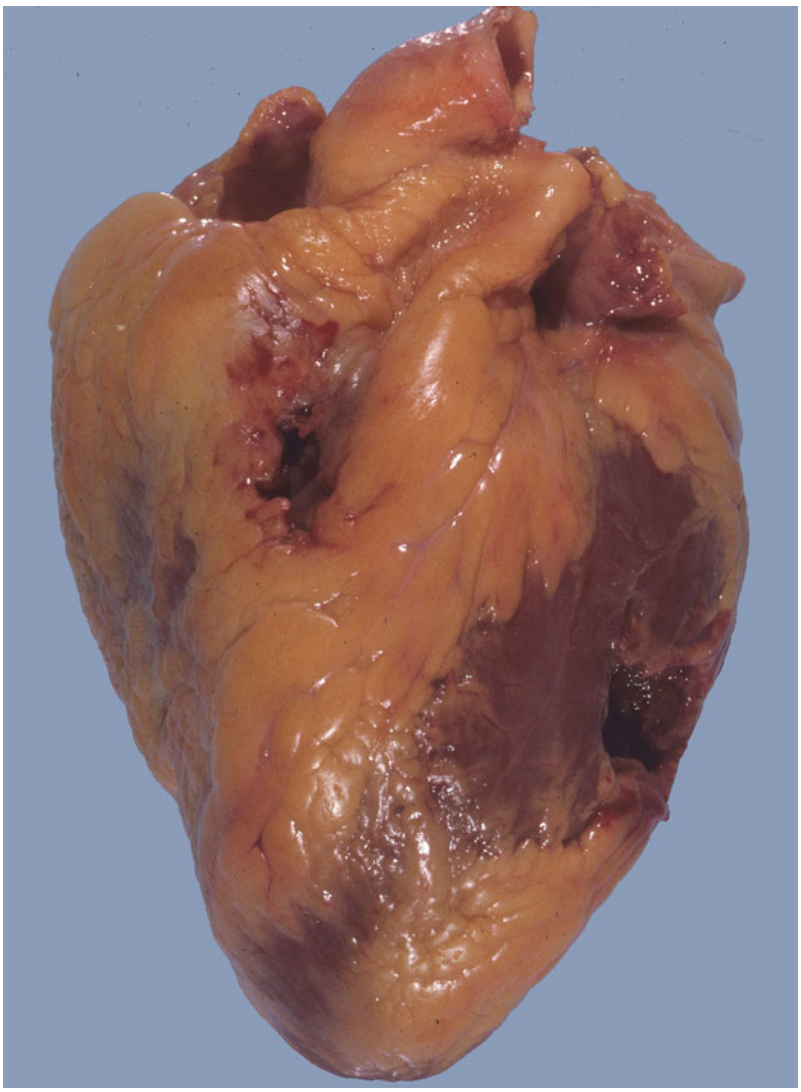

Fig. 13.114
A gunshot wound of the heart

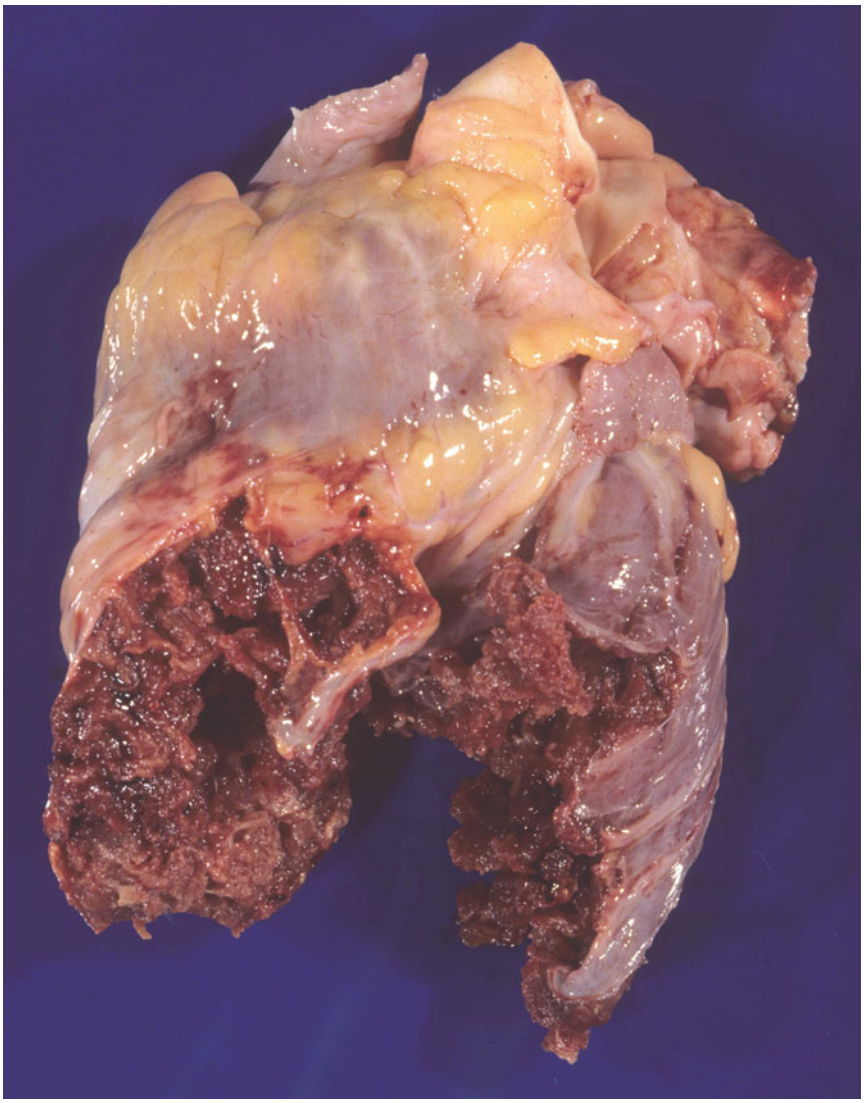

Fig. 13.115
A shotgun slug wound of the heart.

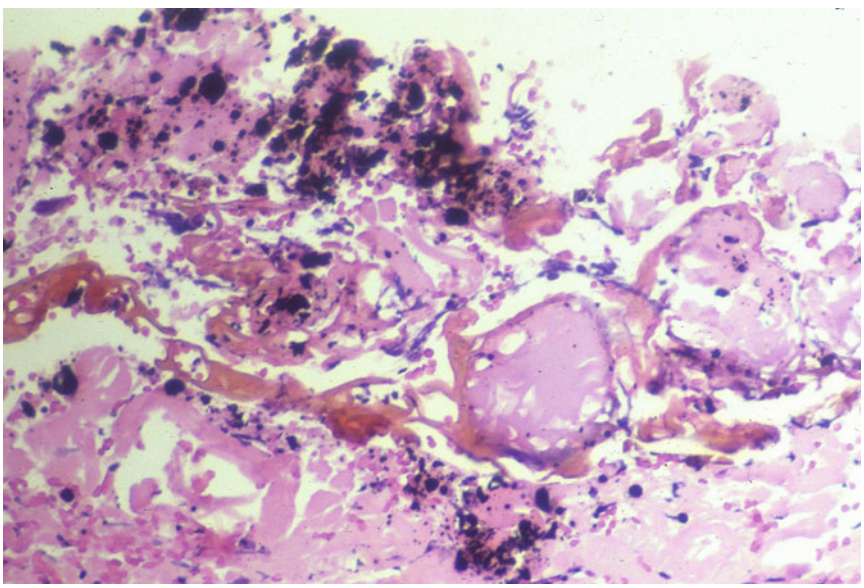

Fig. 13.116
A microscopic section of a contact gunshot entrance wound, showing extensive black particulate matter (soot) deposition

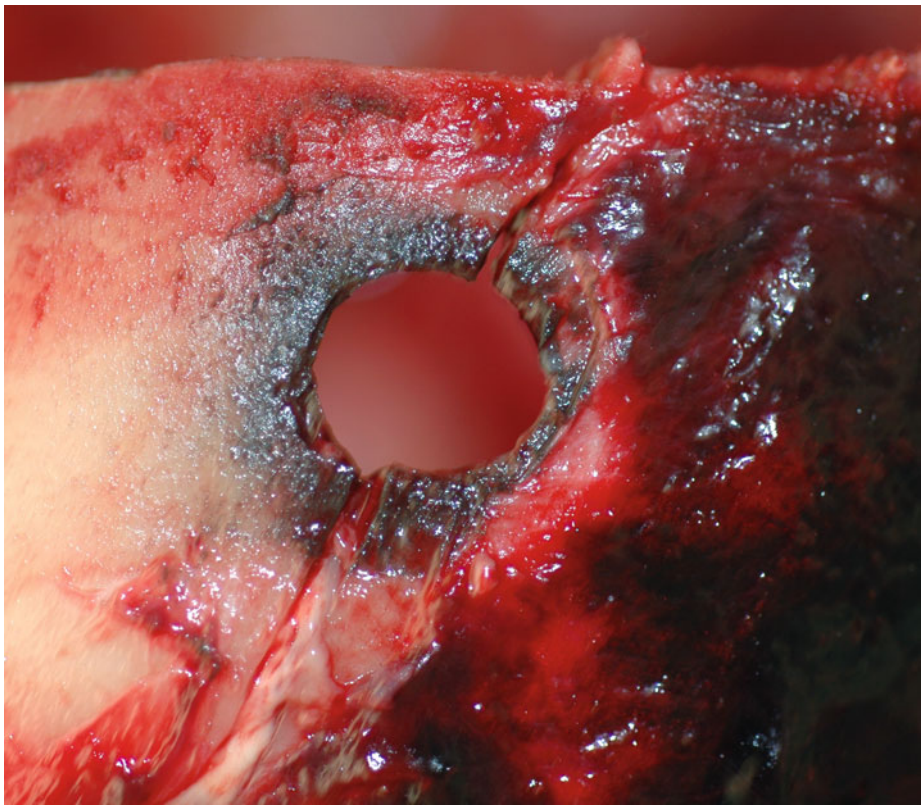

Fig. 13.117
Soot soiling of the bone underlying a contact gunshot wound of the head. In occasional cases, identification of soot on external examination is quite difficult. Finding soot on the skull is beneficial in such cases

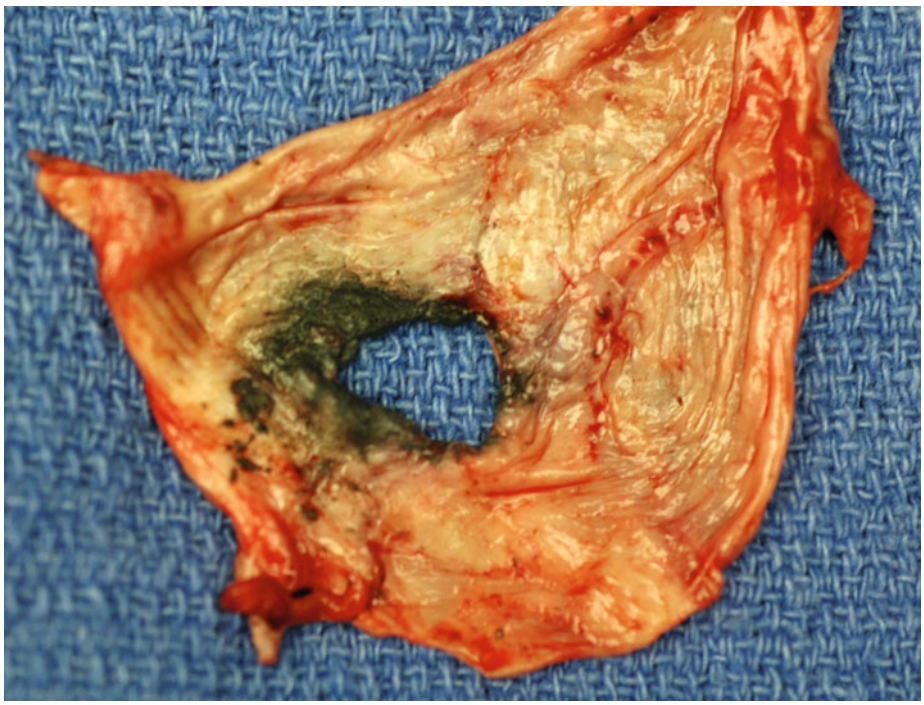

Fig. 13.118
Soot staining the dura underlying a contact gunshot wound of the head. Finding such soot can confirm that a wound represents a contact gunshot wound

Fig. 13.119

An outer view of a gunshot entrance wound of the skull, after scalp reflection (and after peeling away the soft tissue normally adherent to the outer surface of the skull) showing no beveling (shelving)

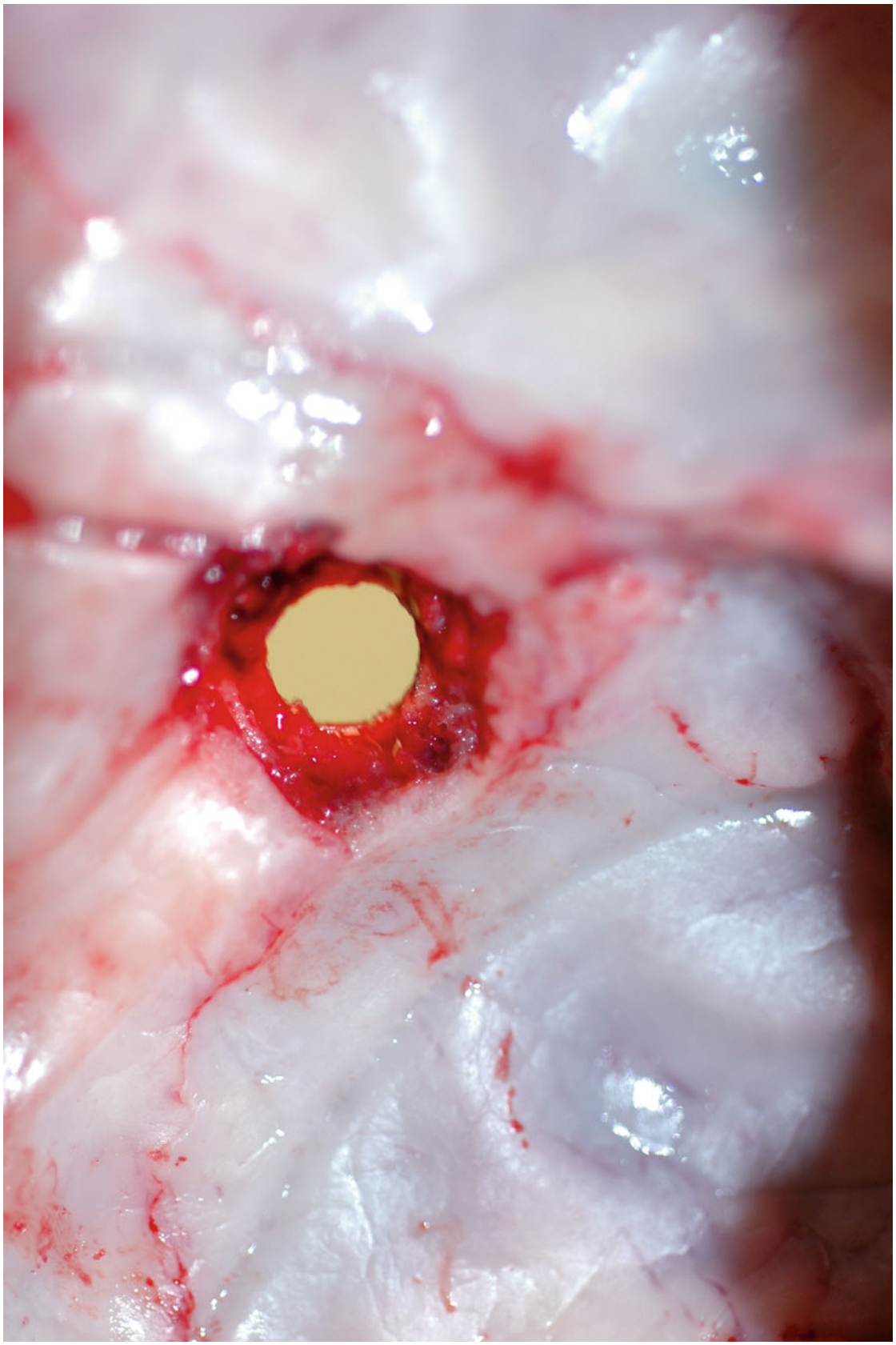

Fig. 13.120
An inner view of a gunshot entrance wound of the skull, showing classic internal beveling. Entrance wounds are characterized by internal skull beveling

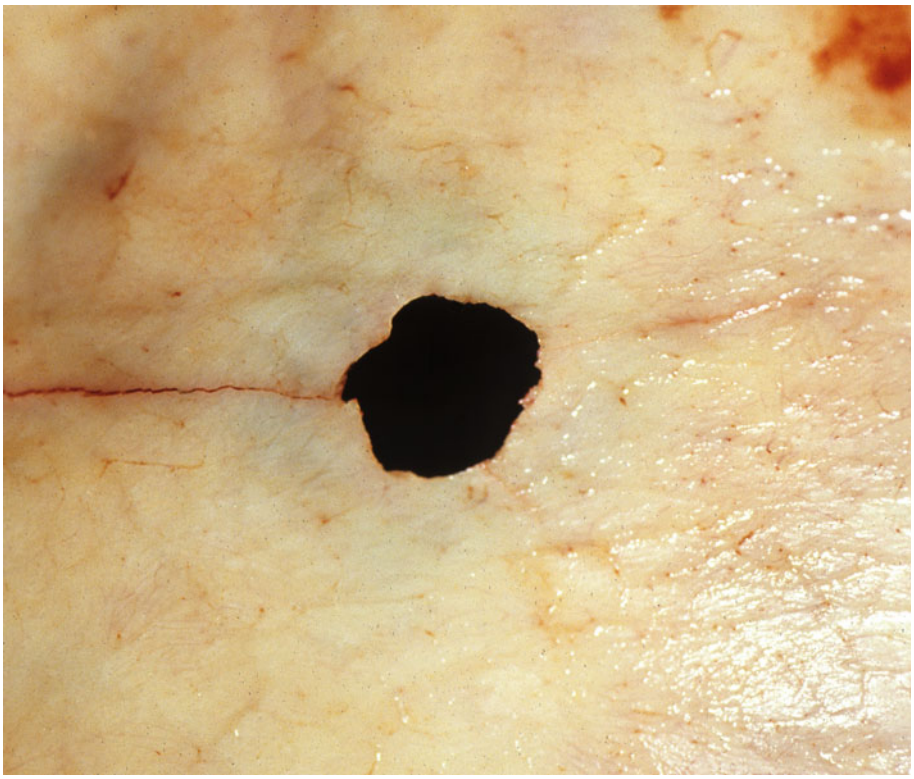

Fig. 13.121
An inner view of a gunshot exit wound of the skull with no beveling

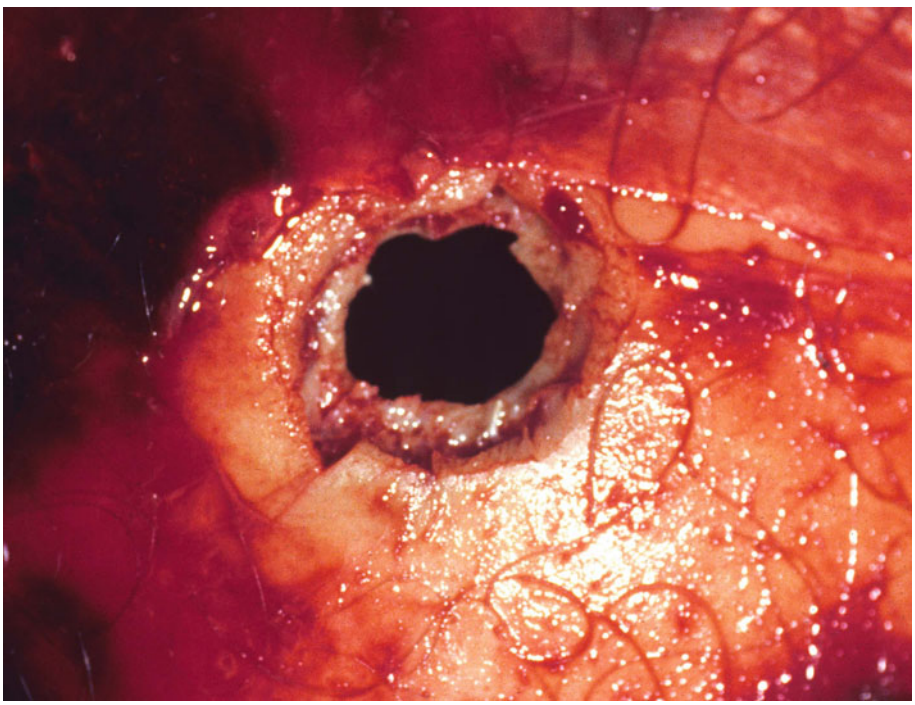

Fig. 13.122
An outer view of a gunshot exit wound of the skull, showing classic external beveling. Exit wounds are characterized by external skull beveling

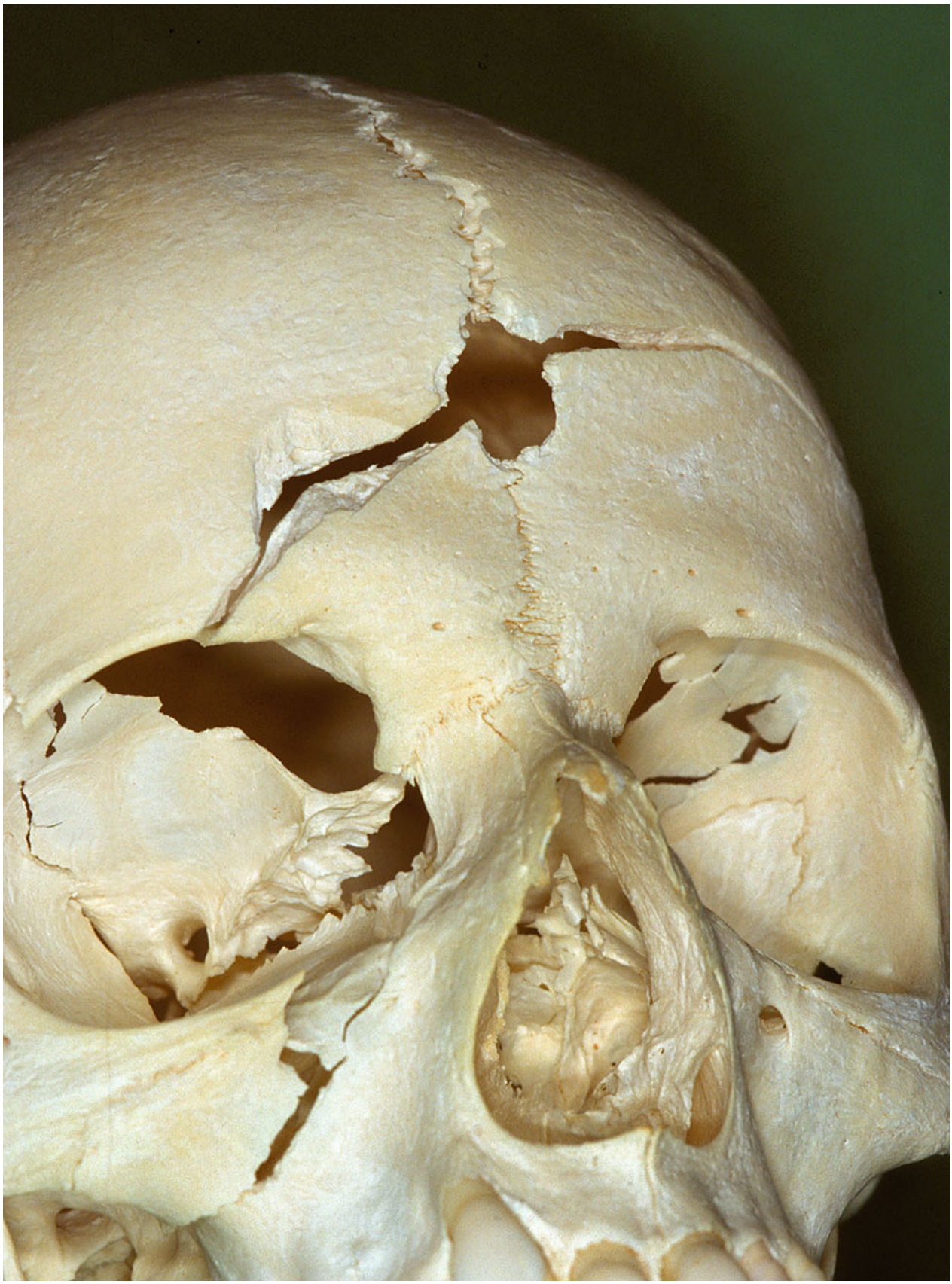

Fig. 13.123
Bevelling may be hard to detect if the entrance/exit wounds are through particularly thin skull bones

Fig. 13.124
An external skull view of a "keyhole" defect produced by a relatively tangential shot of the head, with the bullet traveling from bottom to top of the photograph

Fig. 13.125
Bilateral (involving both sides) periorbital (around the eyes) ecchymosis (bleeding) caused by basilar skull fractures produced by a gunshot wound

Fig. 13.126
A deformed (“mushroomed”) bullet collected as evidence

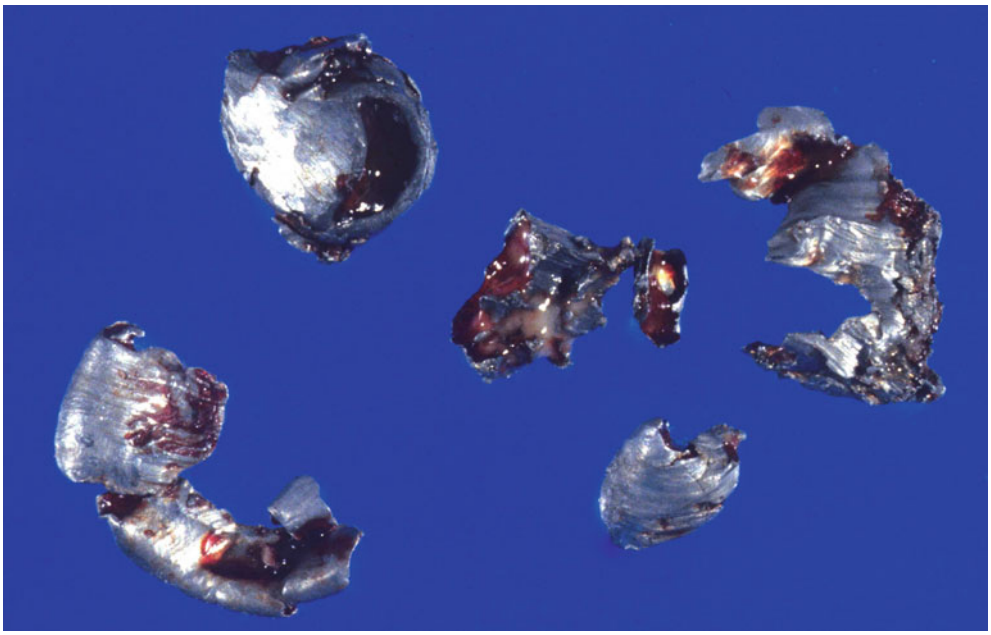

Fig. 13.127
Multiple bullet fragments collected from a single gunshot wound

Fig. 13.128
Evidence collected from the victim of a shotgun injury. Note the representative sampling of birdshot pellets as well as plastic wadding material

Fig. 13.129
Defense wounds of the fingers from a 0.12 gauge shotgun (birdshot pellets)

Fig. 13.130
Defense wounds of the left hand that had been placed in front of the neck

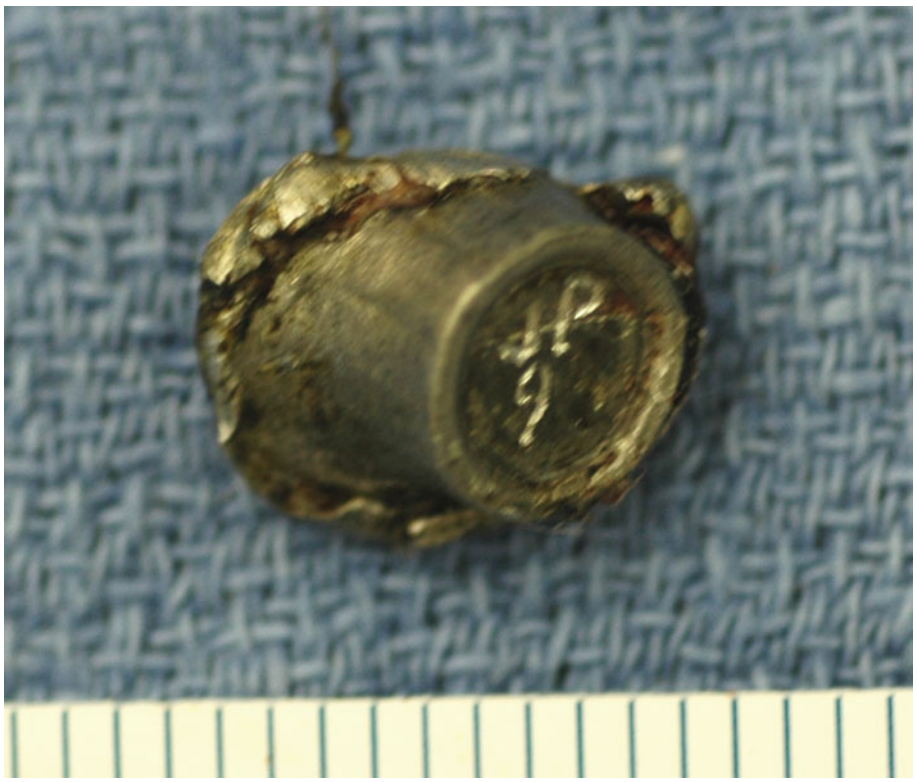

Fig. 13.131
An inscription on the base of the bullet. Some pathologists inscribe the case number and their initials on the base of the bullet. Others choose not to do this

Fig. 13.132
A photograph showing a suicidal gunshot wound of the head, prior to shaving the hair from around the entrance wound

Fig. 13.133
A photograph taken after cleaning the body and shaving the hair from around the entrance wound (see *Fig. 13.132*)

Fig. 13.134
Contact gunshot wound of head, after cleaning and shaving

Fig. 13.135
Contact gunshot wound of head (*Fig. 13.134*), after cleaning, shaving, and reapproximating wound edges using cyanoacrylate (strong-bonding glue)

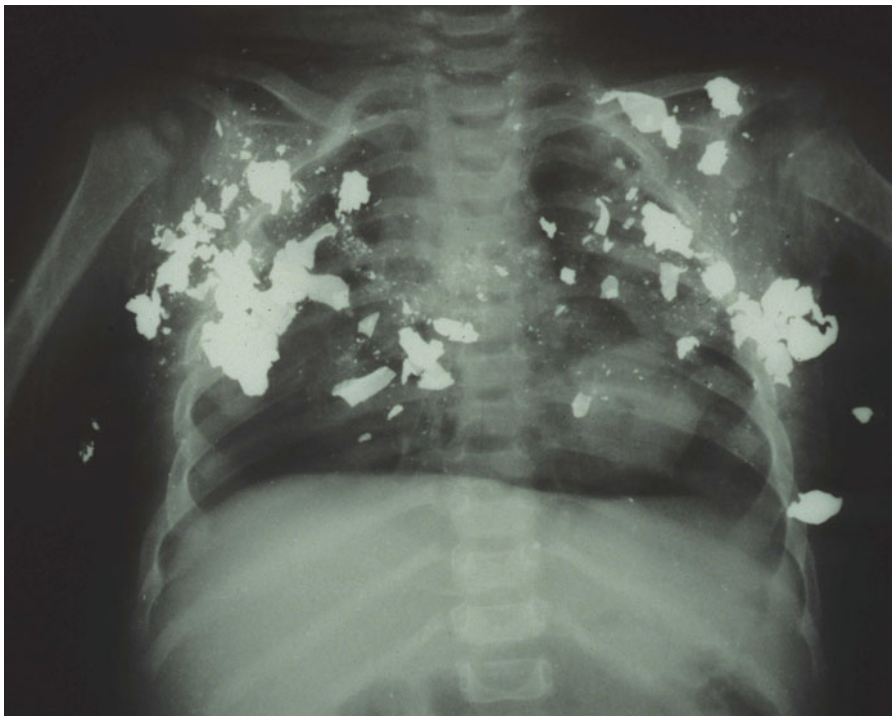

Fig. 13.136
An X-ray taken prior to clothing removal in a toddler who was being held in his mother's arms when she was shot multiple times

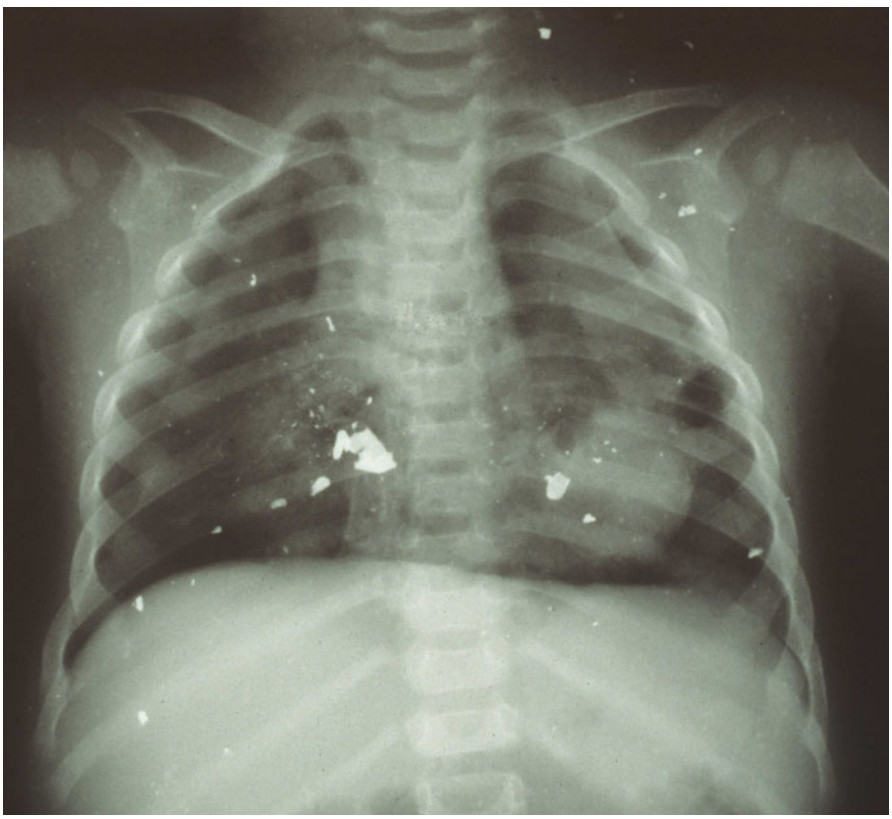

Fig. 13.137
An X-ray taken after clothing removal in the case shown in *Fig. 13.136*. Note that a majority of the bullets exited the body but were retained within the clothing

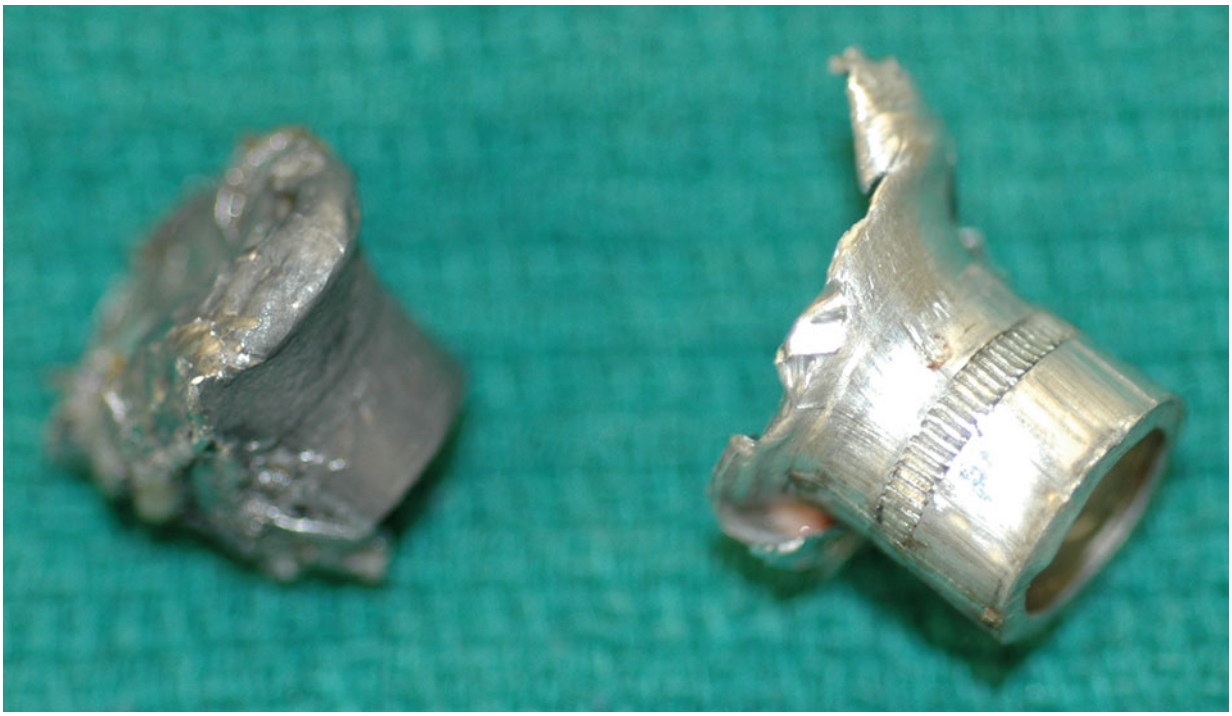

Fig. 13.138
Aluminum-jacketed bullet, with the lead core separated from the jacket. Aluminum jackets are not necessarily visible by X-ray exam

Fig. 13.139
A suicide victim who used a coat hanger to depress the trigger of his shotgun (Photo courtesy of Dr. Patrick Lantz, MD, Department of Pathology, Wake Forest University School of Medicine, Winston-Salem, NC)

Fig. 13.140
Suicidal gunshot wounds occasionally have more than one entrance wound. In this case, a suicide victim was witnessed by numerous people to place the small-caliber weapon under his chin and discharge the weapon. After each of the first three shots, he looked at the weapon, placed it back under his chin, and fired again, for a total of four shots. At autopsy, only one bullet was found to have entered the brain

Fig. 13.141
An example of the dense soot produced with a black powder weapon

Fig. 13.142
Snakeshot or ratshot cartridges are handgun shot cartridges that contain numerous small shot pellets (similar to shotgun cartridges)

Fig. 13.143
An example of the appearance of a wound produced by a handgun shot cartridge

Fig. 13.144
NYCLAD cartridge and bullet. Note that the bullet is covered with a blue material. This material is made of nylon and presumably reduces the amount of residue buildup within the barrel of a weapon, thus keeping it clean. The nylon material makes ballistic comparison difficult as the material does not show microscopic striations as well as lead or various metal jacket materials

Fig. 13.145
A "gilded" small-caliber bullet recovered from a body at autopsy. A gilded bullet has a copper-colored material coating the bullet, but it is not the same as a metal jacket. Note that the copper-colored material has "flaked off" the sides of the bullet. Such bullets can cause difficulty for firearms examiners when attempting to evaluate striations microscopically

Fig. 13.146
A Glazer cartridge, unfired bullet, and fired bullet. These bullets are designed to fragment on impact, presumably making them safer (if a shooter misses their target and the bullet strikes a wall, the bullet will not continue through the wall and possibly strike someone on the other side)

Fig. 13.147
A sabot rifle cartridge, plastic sabot, and bullet

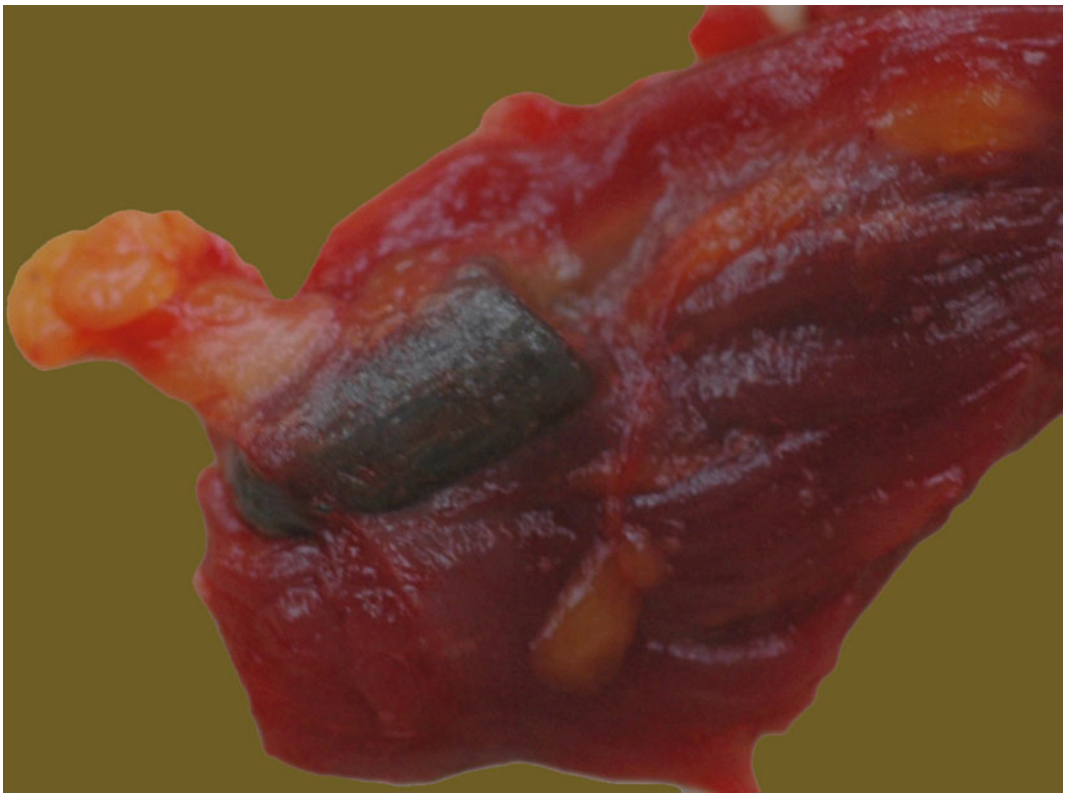

Fig. 13.148
A retained bullet recovered at autopsy. Note that the bullet is embedded within muscle with no surrounding hemorrhage

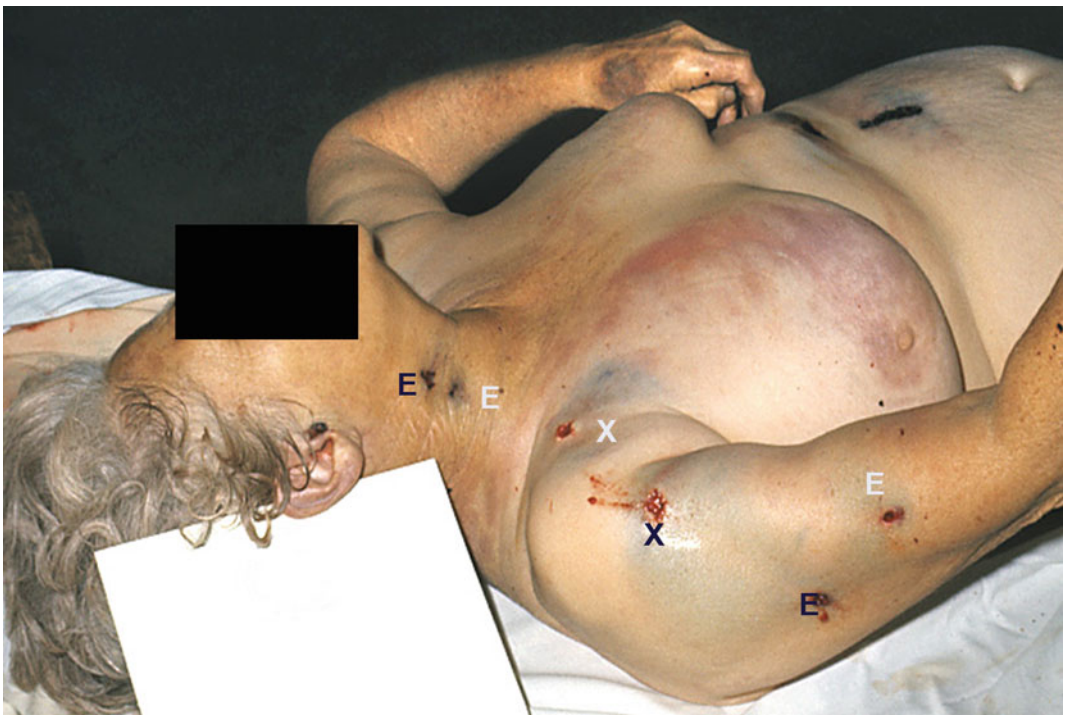

Fig. 13.149
Multiple entrance (E) and exit (X) wounds caused by two bullets

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